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JUNE 1984 / $2.00

WEEDS TREES & TURF

The Magazine of Landscape and Golf Course Management Since 1962

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JUNE 1984 VOLUME 23, NUMBER 6

WEEDS TREES & TURF

The Magazine of Landscape and Golf Course Management Since 1962

22 Disease Control Guide: Cool-Season Strategy

Dr. Joe Vargas, turf pathologist, Michigan State University, offers the latest tips on controlling major cool-season diseases. Chemical and cultural control are included in this reference you'll want to keep.

38 Disease Control Guide: Southern Turf Strategy

Dr. Don Blasingame, extension plant pathologist, Mississippi State University, zeroes in on the major diseases of warm-season turfgrasses and overseeded cool-season grasses.

46 Professional's Guide to Kentucky Bluegrasses

The difference between varieties of Kentucky bluegrass is significant to professional turf managers. Drs. Reed Funk and Ralph Engel of Rutgers describe strengths and weaknesses of common and proprietary Kentucky bluegrasses.

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Compile a reference file of labels and background on turf fungicides by circling the numbers of products listed in this directory on the free information card in the magazine.

64 Engineers Build Self-preservation Into Turf Equipment

Manufacturers of professional turf equipment step beyond the basic engine:wheels:blade to provide longer life and greater reliability. New cleaning and cooling devices take equipment beyond the homeowner grade.

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WEEDS TREES & TURF (ISSN 0043-1753) is published monthly by Harcourt Brace Jovanovich Publications. Corporate and Editorial offices: 7500 Old Oak Boulevard, Cleveland, Ohio 44130. Advertising Offices: 7500 Old Oak Boulevard, Cleveland, Ohio 44130, 111 East Wacker Drive, Chicago, Illinois 60601 and 3091 Maple Drive, Atlanta, Georgia 30305. Accounting, Advertising Production and Circulation offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rates: $20 per year in the United States; $25 per year in Canada. All other countries: $50 per year. Single copies (pre-paid only): $2 in the U.S.; elsewhere $4.50; add $3.00 for shipping and handling per order. Second class postage paid at Duluth, Minnesota 55806 and additional mailing offices. Copyright© 1984 by Harcourt Brace Jovanovich, Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher. Microfilm copies of articles are available through University Microfilm, International, 300 N. Zeeb Road, Ann Arbor, Michigan 48106.

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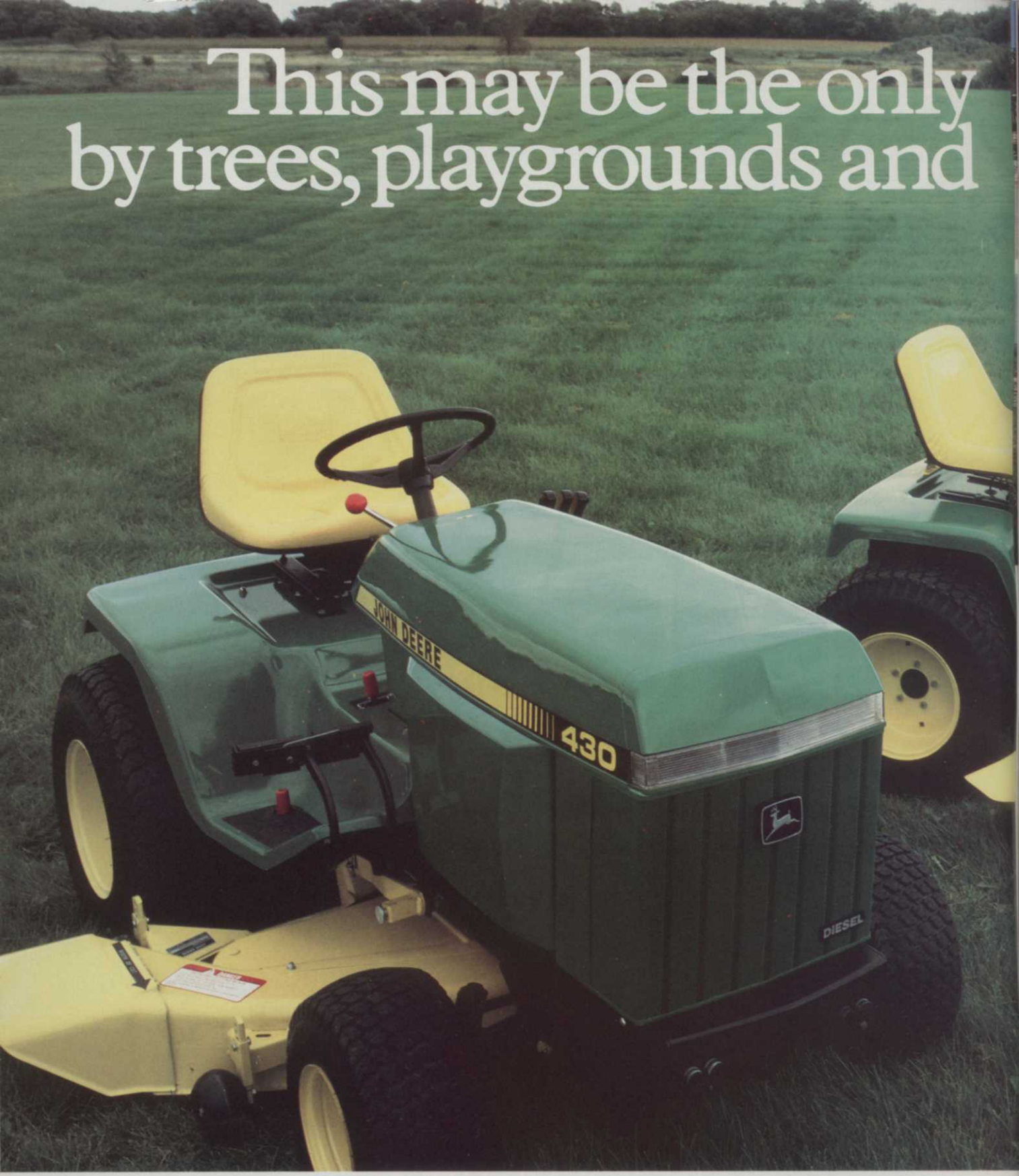

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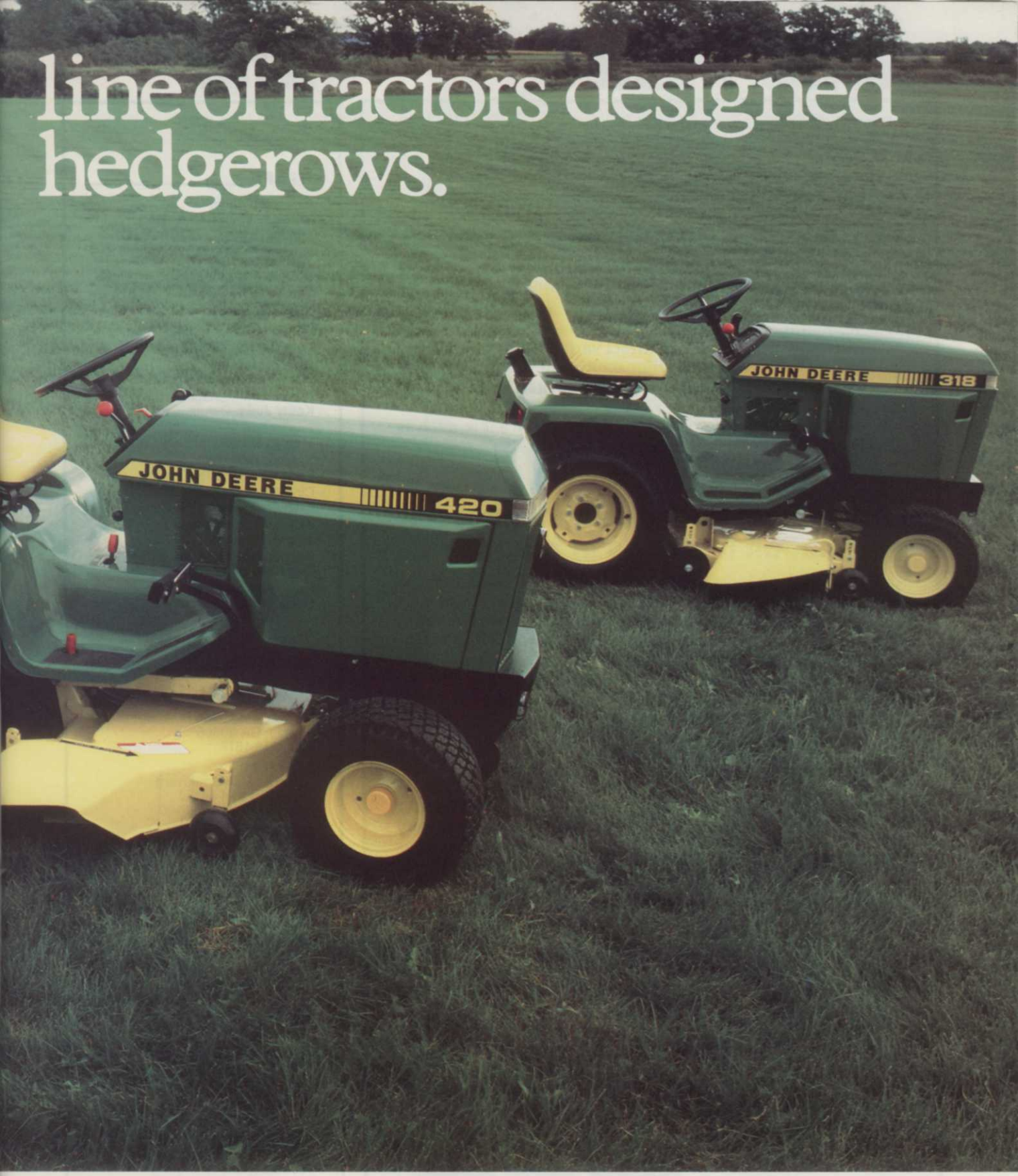

hitch and a 2,000 rpm rear PTO. And a variety of attachments, including rotary tillers, snow blowers or throwers, front blade, thatchers, 3-point hitch mowers, and center-mounted mowers with 46-, 50- or 60-inch cutting width, depending on tractor.

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NEWS/TRENDS

by **Bruce F. Shank**, executive editor

Multi-course ownership grows as TPC eyes 20 courses by 1990

The pattern established by Club Corporation of America and American Golf Corporation is being carried a step further by the Tournament Players Club, which has set a goal to own 20 prestige, stadium-style golf courses within ten years.

TPC courses are designed to attract various tournaments and the revenue television and other media shell out. Pete Dye, primary architect for TPC, has a mean pen when he designs the courses.

Word is most of the 20 courses will be new, but a few, such as Edgewood Country Club, are reconstructed to Dye's specifications. See story in Golf Update.

Low dose pesticides may alter application methods in future

New low-dose herbicides and growth regulators, such as Du Pont's Oust and 3M's Embark are testing current application equipment and technique. These products are used in ounces per acre rather than pounds. Slight miscalculations can have harmful results. The value of the products and the sense of low dose pesticides in regard to environmental concerns, will force rethinking of application technology within the next five years. The resources of companies like Du Pont and 3M will see to that.

Housing starts to hit 1.7 million

The National Association of Home Builders are forecasting more than 1.7 million new homes for 1984. The increase may slow in the second half depending upon interest rate increases following the presidential elections. Apartment construction is expected to fall in some areas due to overbuilding.

Ford exec sees landscape boom

Jack Johnson, general sales manager for Ford Tractor North America, expects a complete recovery in construction by year's end. "The key to revival is housing starts," Johnson told HBJ Group Publisher Bob Earley during Ford's product introduction news conference in San Antonio, TX. The company has introduced new tractor/backhoe/loader models specifically for the landscape construction market.

Jack Johnson

WT&T

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GREEN INDUSTRY NEWS

CHEMICALS

Ortho takes aggressive marketing stance

The Ortho Division of Chevron Chemical Company, which is currently negotiating a takeover of Gulf Oil, has reactivated plans for construction of a fertilizer plant in Wyoming and restructured its Ortho marketing, manufacturing and research organizations to move its marketing management closer to its key markets, says Joseph Eckhart, general manager of the Ortho Agricultural Chemicals Division.

Ortho holds the lead position in consumer gardening products and indications are it intends to do the same in agriculture and professional horticulture. Expanded labels for Orthene and the construction of both a new fertilizer plant in Rock Springs, WY, and a research center in Richmond, CA, indicate the company is aware of the maturing nature of agriculture and the opportunity of speciality markets.

"We are focusing our future activities in research and development on innovative, highly-active products for major crop markets; and we are taking steps to significantly increase new product introductions," Eckhart told Weeds Trees & Turf. "Our market strategy is to improve our operating efficiency and response to customer needs."

Other chemical companies are using Ortho for consumer marketing.

EQUIPMENT

Thieves alter target to farm equipment

For more than a decade equipment thieves have favored construction equipment over farm equipment. That is until this year, says W.E. Rutledge, chairman of the heavy equipment theft committee of the International Association of Auto Theft Investigators.

"Because the construction industry has been depressed, nobody's been working and the contractors were not buying heavy equipment," Rutledge explains. The Association's figures for Missouri show 167 pieces of construction equipment were stolen, compared to 451 pieces of farm equipment. The total loss in the state to large equipment theft is estimated at $19.7 million. Missouri ranks fourth in the nation in large equipment theft.

Law enforcement officials have traced a large portion of the stolen equipment to ports on the Gulf of Mexico. They complain that the equipment is easy to steal, hard to trace, and easy to sell because it is not registered.

With construction on the upswing, thieves might return to their old favorite, construction equipment. Also, since the average cost of stolen equipment is $32,000, it makes sense to take extra precautions as business picks up and work schedules get complicated.

Dinah presented golf architect's award

Dinah Shore was presented the Donald Ross Award for her support of Women's golf during the American Society of Golf Course Architects annual meeting in Palm Springs, CA.

MEETINGS

Arborist reservations needed now for 1985

February 1985 seems like a long way off, but if you are an arborist planning to attend the National Arborist Association annual meeting on St. Thomas, Virgin Islands, you need to send your deposit to the hotel before the end of this month.

The meeting will be held at the Frenchman's Reef Beach Resort, Feb. 3-7, 1985. The area features tennis, golf, sailing, scuba diving, and, of course, a beach.

Bob Felix, NAA executive vice president, says early reservations are needed since there is no such thing as walk-ins on an island and the hotel must coordinate services with ships and planes. For information contact NAA at (516) 221-3082.

TREES

Deterioration of forests noted in Eastern U.S.

Air pollution is the chief suspect for

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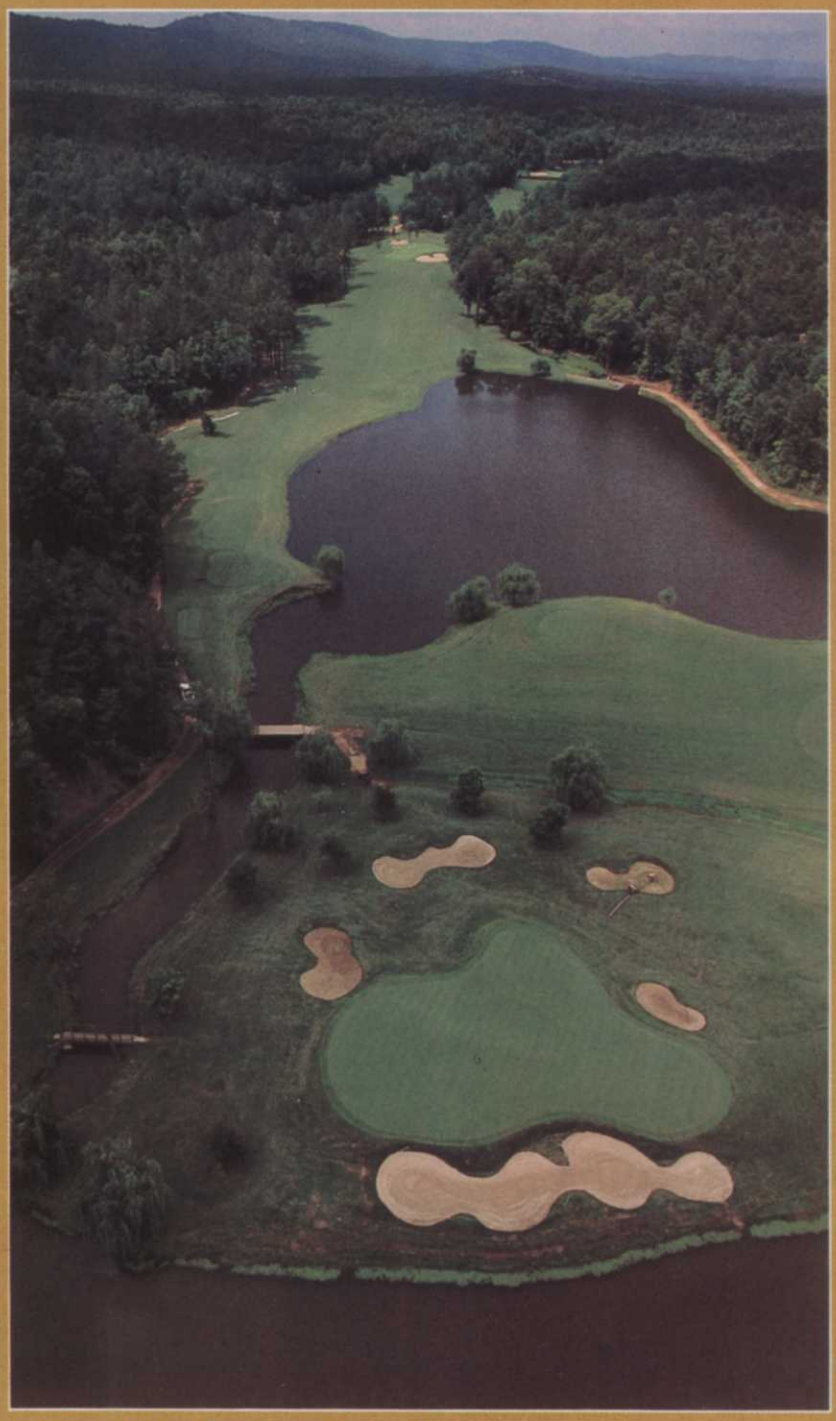
1984 PGA putts on PENNCROSS



18th green at Shoal Creek, Shoal Creek, Alabama

Shoal Creek, Alabama

At the rugged Shoal Creek course, host of the 1984 PGA Championship August 16-19, 1984, the touring professionals will again be putting on Penncross creeping bentgrass. Penncross and Penneagle, the Penn Pals, are no strangers to the pros. Most of the recent major championships have been played on one or the other. The Western open at Butler was played on Penneagle fairways and greens. The 1983 US Open at Oakmont was played on Penneagle tees, fairways and greens. Maybe you saw the sixty-foot putt on Penneagle.

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UPDATE

Latest NGF data is out

The National Golf Foundation's latest report shows 56 new golf courses were opened last year and 48 courses were expanded, for a total of 12,197 courses in the U.S.

Florida had the most new courses with 12, 11 connected with real estate developments, and a total of 30 new or expanded courses. Texas claimed second with ten new or expanded courses. Minnesota ranked third with eight, and Arizona, California, and Wisconsin each had six openings.

The future looks as bright with construction starts on 100 new or expanding courses last year. Another 102 are in the planning stage. Florida also leads in these categories, but Michigan and Illinois are showing up near the top of the starts and planning lists.

Growth of public courses has greatly outpaced private courses in the last ten years. Since 1973 the number of daily fee courses has increased by roughly 800 and municipal courses by 400. Meanwhile, the number of private course has increased by 90. Today, there are 4,809 private courses, 5,528 daily fee, and 1,860 municipal.

The number of golfers has increased by five percent in the past five years for a total of 17.8 million. For a complete copy of the report contact the National Golf Foundation, 200 Castlewood Drive, North Palm Beach, FL 33408.

GCSAA, NGF plan joint survey

A nationwide study of golf course maintenance activity will be conducted this summer jointly by the Golf Course Superintendents Association of America and the National Golf Foundation. GCSAA says superintendents of every course in the U.S. will be asked to share information on turfgrass maintenance practices, operating and capital budgets, and equipment use and needs. GCSAA has 5,000 members so the balance will have to some from NGF or other lists.

Questionnaires will be mailed this month. The returns will be complied by the University of Kansas and results will be available by late summer or early fall, according to GCSAA. NGF President David Hueber says the survey is a pilot program in a long-range cooperative arrangement between the two organizations.

TPC family grows to five

The renovation of Edgewood Country Club, Cromwell, CT, under the direction of architect Pete Dye is nearing completion and renaming to TPC of Connecticut, the fifth club to be owned by the Tournament Players Club. The Greater Hartford Open will be played there in July. A sixth TPC course is under consideration in Potomac, MD. Active discussions are also ongoing in six other locations by TPC. The Tournament Players Club is rapidly becoming a major multi-course company and land owner.

deterioration of forests from the Ohio Valley to the East Coast. Studies by the U.S. Forest Service and Butler University in Indianapolis, IN, point to air pollution to reduced growth rates of conifers and poor foliage production of softwoods. Hardwood trees are also showing symptoms as measured by studies of the growth rings of trees.

Scientists liken the problem to a similar event in Germany where 35 percent of the forest declined or died more than 20 years ago. Trees monitored for timber and paper use have shown substantially less growth than expected during the past 15 to 25 years, says Dr. Authur Johnson of the University of Pennsylvania.

More specific blame has been placed in the Ohio Valley where many coal-burning plants are located. Dr. Orie Loucks, director of the Holcombe Research Institute, Butler University, described symptoms as discoloration of foliage on pine, tulip, poplar, sycamore, white ash, hickory, maples and black oaks. Also mentioned are narrower growth rings and a higher degree of mortality.

PEOPLE

Names in the news

Joe Troll made it 25 years of quarterbacking the Massachusetts Turfgrass Conference in March. Joe may be retiring soon and considering this year's conference, he is going out as a winner.

Bob Mullane, president of Alpine Tree Care, Inc., White Plains, NY, is the new president of the National Arborist Association. A University of Massachusetts graduate, Mullane said his goal is to reach out to others in the industry by attending at least ten industry shows. **Neil Engledow**, Mid-Western Tree Experts, Indianapolis, IN, will follow Mullane as president next year.

David K. Scatterday, has joined Martin Associates, Inc., Prairie View, IL, as a project manager. Scatterday is a landscape architecture graduate from the University of Illinois.

Lyle Borg, has been named sales manager for all Vermeer products by president Stan Vermeer. **Kevin Groomes** is the new industrial product sales manager for Vermeer, in charge of both tree and trencher products.

Gordon Mitchell brings 24 years of sales experience to Brouwer Turf Equipment as marketing manager. Gerry Brouwer, president, said Mitchell will be responsible for product introductions, dealer recruitment, advertising and promotion.

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LANDSCAPE UPDATE

New study reveals local garden shows pay off for contractors

A new study by *Weeds Trees & Turf* reveals participation by landscape contractors in local garden shows adds to credibility and builds a small, but solid base of referrals during the off-season.

Contractors interviewed spend up to 250 hours and $35,000 to design, set up, and tear down displays. Garden shows lend credibility to newer contractors, show homeowners the potential of landscaping, and help contractors reestablish contact with former customers and suppliers.

"People recognize immediately you are a good contractor," says Russell Jones, president of J. Franklin Styer Nurseries, Concordville, PA. "Any time you can achieve customer contact, it's very critical, especially in the off-season, "Bob Kinney, vice president, Wilmore Gardens, Denver, CO, stressed. "One good customer gained from a show can turn around and give you 25 more customers in the next year," according to Lambeth Marshall, president, Associated Landscape, Inc., Hoyt Court, NC.

Undeniably leads from these shows are residential, but corporate executives have been known to make impressions about contractors while attending garden shows in their area. The complete report will be published in an upcoming issue of *Weeds Trees & Turf*.

Poor acclimation suspected for problems with large ficus

Survival problems with large Ficus trees transplanted to interior landscapes is now being linked to inadequate acclimation of field-grown trees to containers by the Interior Landscape Division of the Associated Landscape Contractors of America. Originally, the marl soil the trees were grown in was suspected. ALCA reported the problem this past fall and has tried to find a common link among problem trees.

ALCA says a process of root pruning, container size, proper digging and acclimation all effect the tree's ability to survive on location. The best tree is one that has apparently been growing in a container rather than in the field prior to installation.

Contest entry time is here

Summer is the time to enter many landscape award contests; including ALCA's Fifteenth Annual Environmental Improvement Awards, the Florida Nurserymen and Growers Association Fourteenth Annual Landscape Awards, and the California Landscape Contractors Association Trophy Awards.

The keys to winning landscape awards are knowing the job may be award material before it is started, good before and after photography, thorough records of the job as it progresses, testimony from the owner as to the impact of the project, following the contest rules closely, and presenting the entry material in a neat and attractive fashion.

Mike Bush has been appointed manager of Cypress Gardens' Nursery Division. Bush hopes to expand the attraction's existing collection of rare tropical and subtropical specimen plants. "I beleive there is a wealth of plant material in places like Brazil, Argentina, and Paraguay that has yet to be exploited," Bush said.

Exmark Mfg. Co., Beatrice, NE, has promoted **Dick Tegtmeier** to executive vice president. Bob Martin, president, said the promotion was the result of "remarkable" growth for the fairly new mower manufacturer.

LESCO Inc. has named two territory managers. **Les Guedel** will be manager of East Coast sales and **Jim Johnson** will manage North Central sales for the company based in Rocky River, OH.

Ray Lewis and his wife returned from the Las Vegas GCSAA Show with some unpredicted baggage, a Dedoes trailer aerator. The Lewis couple won a drawing during the show.

JOB HUNTING

Turf and landscape recruiter opens doors

A firm specializing in recruiting personnel for the turf and landscape industries has been launched in Littleton, CO. S. Ronald Gaston and Associates will handle national fee-paid positions for golf course superintendents, landscape architects, and other professional landscape positions.

Ron Gaston says his firm is the first of its kind. A pamphlet describing the new service is available by writing the company, P.O. Box 2527, Littleton, CO 80161.

TURF SEED

Danish company's U.S. branch renamed

Daehnfeldt, Inc., is the new name of Pacific Seed Production in Albany, OR, after the Danish seed company decided to clear up any confusion about its presence in the U.S.

L. Daehnfeldt of Odense, Denmark, signed a cooperative agreement with Pacific Seed in 1982 to develop a joint Danish/U.S. breeding and production company. Many European seed companies are active in the seed growing regions of the northwestern U.S., often through U.S. companies. Growing conditions and land are more favorable in the U.S. than in Europe.

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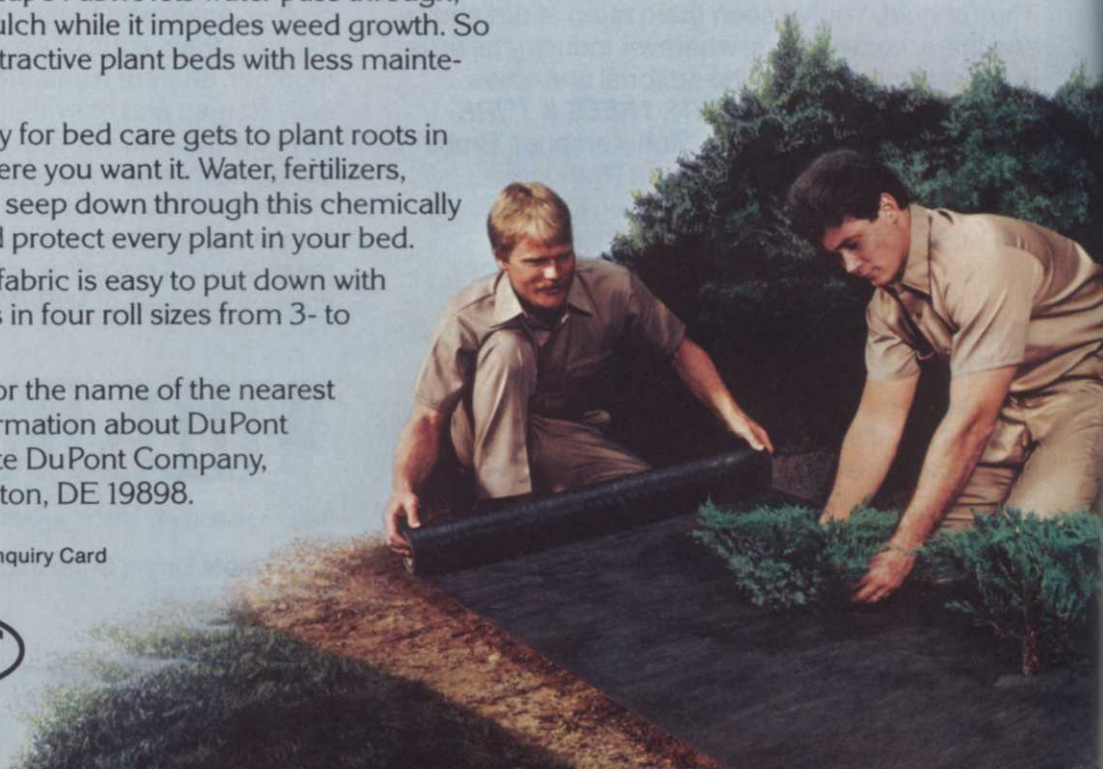

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DU PONT

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age, vegetable, and flower seed varieties, both in Denmark and in Oregon. Daehnfeldt plans "substantial growth and expansion" to expedite sale of supplies from its Denmark operation in the U.S.

INSECTICIDES

Mocap receives label for six more turf insects

Rhone Poulenc has received EPA approval to add six turf pests to its label for Mocap 10 percent granular. First registered for use against nematodes and mole crickets, the label now includes sod webworms, chinch bugs, Japanese beetle, black turfgrass ateanius, European chafer,and the bluegrass billbug.

The application rate for the six pests is half that for mole crickets, 1.25 lbs./acre. Only professional turfmen are permitted to apply the product for the new pests.

"The expanded label shows Mocap's ability to control a broad spectrum of insects, including grubs," says Dan Stahl, turf product manager for Rhone Poulenc.

ASSOCIATIONS

Agriculture secretary to give AAN awards

Secretary of Agriculture John R. Block will host a reception for the winners of the American Association of Nurserymen's 1984 Landscape Awards competition after the awards are presented at a White House ceremony, on May 17.

A custom established by Lady Bird Johnson is for the awards to be presented by the President or the First lady in the Rose Garden. Mrs. Reagan presented the awards to the winners in the White House in 1982.

The awards will be presented two months before the 109th Annual AAN Convention in San Antonio, TX, July 14-17. Lady Bird Johnson will address the conference during the meeting. Mrs. Johnson continues to take a leadership role in beautification of parks and roadsides.

SURVEY

Ontario spends $275 million on turf

A survey, intended partly to justify expansion of turf extension programs

continued on page 80

GOVERNMENT UPDATE

Correction on Monsanto/EPA suit

The suit reported in the March issue should not be confused with the patent suits Stauffer has filed against Monsanto.

First, there is no suit between Stauffer and Monsanto in the Supreme Court. The Supreme Court suit is between Monsanto and EPA only. Secondly, Stauffer should have been listed as one of those who has filed an Amicus curiae brief in support of Monsanto's position in the Supreme Court case against the EPA. Finally, Stauffer's opposition is that "Me-to" registrations should be nullified.

Johnson says major changes in FIFRA unlikely this year

In an exclusive letter to *Weeds Trees & Turf*, Edwin Johnson, Director, Office of Pesticide Programs, EPA, said, "Substantive FIFRA amendments are unlikely (this year). Rather than pursuing legislative changes this year, the Administrator is seeking administrative changes and remedies to pesticide regulatory problems through the newly formed Pesticide Advisory Committee."

Simazine receives soil restriction

After Dec. 31, 1984, labels on simazine products will bear a restriction against use of the product in areas where groundwater contamination is likely. This generally means it can not be applied to soil in areas designated Sole Source Aquifers by the Soil Conservation Service.

Surflan has experimental turf label

Elanco's Surflan, currently registered for selective preemergence control of annual grasses and broadleaf weeds around ornamentals, has received an experimental use permit for weed control in 16 Southern states.

EPA's Moore claims restrictions needed to prevent contamination

John Moore, assistant administrator for Pesticides and Toxic Substances, claims some pesticides will have to be banned or restricted to protect groundwater from contamination. Moore suggested that EPA could point out which pesticides are potential ground water polluters and let the states handle restrictions. "Soil fumigation technology needs to be rethought," said Moore. Reregistration is taking too long to adequately protect groundwater according to Moore.

Get ready for renovation work

Much of July's work is follow-up on spring work. It is when insecticide, herbicide, and fungicide applications are renewed, evergreens are pruned and shaped, and irrigation is closely monitored.

From a planning standpoint, July is when you should nail down fall renovation work and order the necessary supplies. Do not assume everything you need for renovation work will be available. Sell renovation work early in July and notify your suppliers as soon as possible of your needs. Winterkill replacements earlier in the year and reported shortages in some turf seed may limit the renovation work you can do this year.

Labor planning is especially important, considering how valuable renovation work can be while, at the same time, seasonal labor is departing. Quite often renovation work in August and the fall is more important than work during the busy season. By August, seasonal crews are skilled and more efficient than they would be the following spring. Work is therefore more efficient from both labor and plant standpoints.

Chemical renewal

Preemergence herbicides in plant beds and container plantings may need to be reapplied now. Check the label for the length of time the preemergence herbicide you use is effective.

Second applications of turf insecticides may also be needed in July to control severe grub, chinchbug, and greenbug infestations.

Many foliage-feeding and sucking insects are at harmful levels in July. Injury during the summer reduces carbohydrate storage by plants leaving plants more vulnerable to winterkill and reducing bud development. Serious foliage feeders include Japanese beetle, gypsy moth, black vine weevil and bag worms. Control is most effective when insects are small. Controls include Sevin, Turcam, Orthene, Diazinon, and methoxychlor. Sucking insects include spider mites, aphids, white flies, and lace bugs. Mite control requires Dicofol, dymet, or Vendex. Malathion, Orthene, Diazinon, dimethoate and Sevin may be used for the other sucking insects. These materials are also effective against the crawler stages of scale insects active at this time.

Hot, humid weather encourages a number of turf diseases, including pythium, anthracnose of *Poa annua*, *Fusarium* blight, and brown patch. Since poor drainage is a prime cause of these diseases, make a note to improve drainage and air flow of problem areas this fall. Turf fungicides typically have residual periods of less than three weeks. Bayleton, a fungicide with season-long residual must be applied before diseases start, usually sometime in early June. Not all fungicides are effective on all turf diseases. Check with your chemical supplier, the Disease Control Guide in this issue, or local extension agent for specific control information.

Most ornamental disease control is based on control beginning prior to or following bloom. Roses require treatment every two weeks during the summer for black spot and powdery mildew. Preventative spray programs should be established for susceptible plants.

Irrigation

The role of irrigation in landscape management is being closely evaluated today. Water-sensing devices called tensiometers are being added to irrigation systems to reduce water use. Drip irrigation can greatly reduce water use for ornamentals. Wetting agents are gaining acceptance to correct localized dry spots. Plant breeders are selecting plants which require less water. Water use is no longer taken lightly.

As mentioned in a previous issue, Dr. Joe Vargas, plant pathlogist from Michigan State University, is recommending light, mid-day irrigation to encourage an active thatch layer. Vargas believe beneficial organisms, which aid in thatch and disease control, are most effective if the thatch layer is not allowed to dry out. Irrigation should be brief, just to moisten the thatch, at mid-day so leaf tissue does not remain damp for long periods.

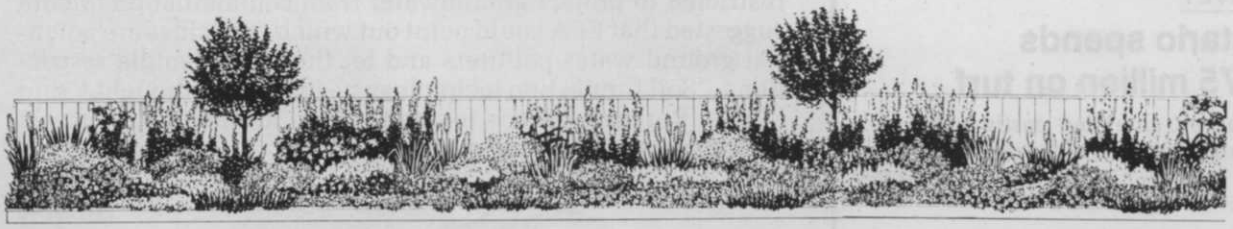
Dr. Robert Shearman of the University of Nebraska, is recommending irrigation at the first signs of wilt. Then, Shearman recommends a deep soaking to encourage deep rooting and lower disease potential.

Pruning conifers, pines

The best time to prune conifers and pines is July. Shearing half the candle growth results in a denser plant, and if done every year, produces a dwarf plant. This is helpful to keep plants within their intended size and shape in the landscape design.

Juniper, yew, and privet hedges can be shaped at this time. For best foliage appearance, the lower branches should be longer than the top so that all foliage receives adequate sunlight. Otherwise, lower branches will have sparse foliage. **WT&T**

Landscape Log is written based on previous publications by Dow Gardens Horticulturist Douglas Chapman, the Weed Control from March 1983, and the Disease Control Guide in this issue.



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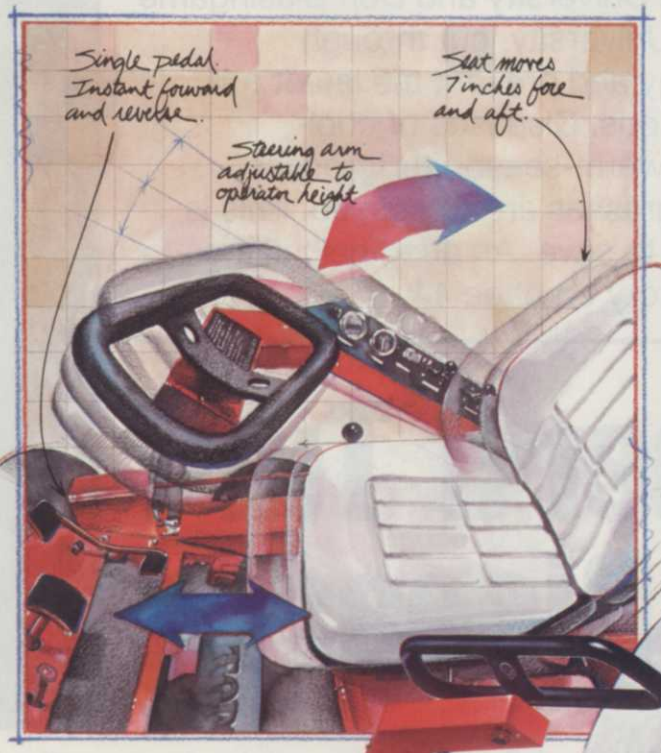

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TURF DISEASE GUIDE

Two leading plant pathologists, J.M. Vargas Jr. of Michigan State University and Don Blasingame of Mississippi State University, cut through confusing terminology and present the latest turf disease control methods. Diseases of cool-season turfgrasses, warm-season turfgrasses, and overseeded ryegrasses are discussed. This is a section you'll want to save. An aded help is the Turf Fungicide Directory on page 44.

Northern Turf Diseases

by **J. M. Vargas, Jr.**, turfgrass pathologist, Michigan State University

Concepts about turfgrass diseases and their management have gone through many changes in the past few years, including the scientific names of the organisms that cause them.

These diseases, the organisms that cause them, and their cultural, biological and chemical management tools are given in Table 1. The following will be a discussion of the latest developments on cool-season turfgrass diseases.

Dollar spot

Dollar spot is primarily a disease of golf course grasses such as creeping bentgrass and annual bluegrass. It is now believed to be caused by two organisms, a *Lanzia* spp. and a *Moellerodiscus* spp.

Now that two fungi have been identified as the cause of dollar spot, it helps explain some of the confusion that has existed about the occurrance of this disease. It has been considered both a cool weather disease and a warm weather disease. It appears that dollar spot is both, and that there are two different fungi which caused a disease with similar symptoms. This means that you can have dollar spot at any temperature between 60-85° F.

What is needed is an easy, reliable method to distinguish the difference between these two fungi in the field. Fortunately, dollar spot caused by both fungi appears to be reduced by adequate nitrogen levels and adequate soil moisture levels. For the most part, they are also managed by the same fungicides, although one has to wonder if some of the resistance to some fungicides might not be due to the differential sensitivity of the two fungi species that causes this disease.

Brown patch

Brown patch is also primarily a disease of golf courses, although with the new improved perennial ryegrasses being incorporated into home lawn mixtures, it is also becoming a problem on home lawns.

The disease occurs under hot, humid conditions. It can be culturally managed by reducing the amount of nitrogen applied just prior to the advent of warm weather, increasing air circulation by removing trees or shrubs, and/or by pruning them.

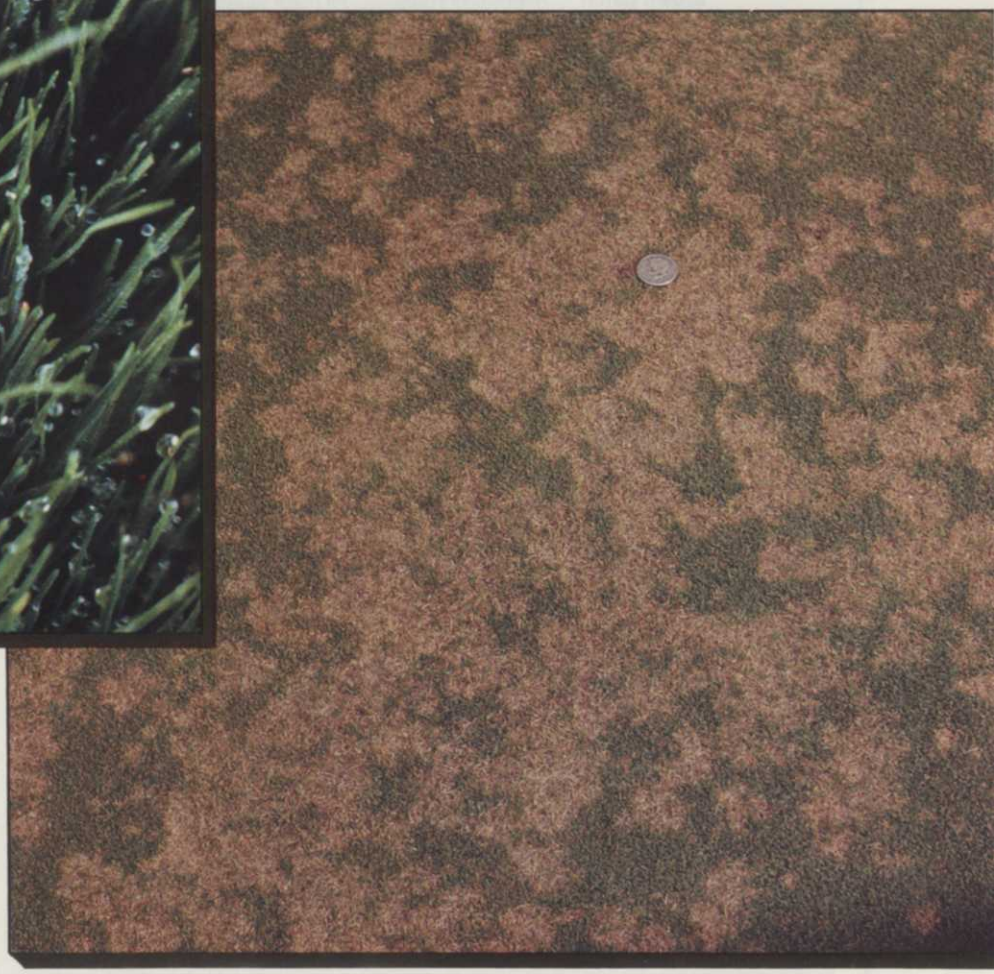
Pythium blight

Pythium blight is also a disease of golf courses, and like brown patch, it is becoming more of a home lawn problem with the incorporation of the improved perennial ryegrass.

There still seems to be some controversy over how many species of pythium are involved in this disease, but regardless of how many or how few there are, they do tend to cause rapid loss of turf in hot, humid weather.

Unlike many diseases where only the foliage is damaged and recovery occurs soon after, Pythium blight usually kills the plant. This means recovery in the infected areas will be slow because it will have to come from

Pythium blight *rapidly strikes ryegrasses and other turfs where drainage is poor in hot and humid weather. Recovery is slow since pythium usually kills the entire plant.*



Dollar spot *damages bentgrass, annual and perennial bluegrass, bermudagrass and zoysiagrass. In the South it is common in the spring and fall. In the north it is active anytime temperatures are between 60 and 85°.*

rhizomes or stolons filling in from outside the spots or by germination of annual bluegrass or broadleaf weeds when the cool weather of the fall returns.

Cultural management of Pythium blight consists of reduced nitrogen levels just prior to the advent of warm weather and improving drainage.

Concerning drainage, in marginal areas of the cool-season grass regions, Pythium blight is only a problem in areas of poor soil drainage, where water stands for prolonged periods. In regions where severe Pythium blight damage occurs, it is always most severe in poor drained soil areas. It goes without saying, that good Pythium blight management begins with improving soil drainage.

As far as chemical management is concerned, there are two systemic fungicides to manage Pythium blight, which are metalaxyl (Subdue, Ridomil, Apron) and propamocarb hydrochloride (Banol). These two fungicides will manage the disease for up to three weeks. They appear to be slower acting than chloroneb (Teremec SP) or ethazol (Koban, Terrazole). Little spread of the disease occurs after these systemic fungicides are applied, although the mycelium of the fungus may remain evident on the previously infected tissue for a couple of days. No actual resistance to these two fungicides has been reported, but the possibility exists. It would be wise therefore, to follow each systemic fungicide application with contact (chloroneb or ethazol) in case resistance does occur following a systemic fungicide application, the contact fungicide will prevent the resistant strain from devestating the turf.

Anthracnose

Anthracnose caused by *Colletotrichum graminicola* is primarily a disease of annual bluegrass, although it will attack the fine leaf fescues, perennial ryegrasses and seaside creeping bentgrass.

Annual bluegrass dies from an-

TURF

Table 1: TURF DISEASES AND CONTROLS*

Disease	Causal Agent	Hosts	Cultural Control	Chemical Control
Anthracnose	*Collectotrichum graminicola*	Annual bluegrass Fine-leaf fescue Kentucky bluegrass Perennial ryegrass	Adequate nitrogen. Cool grass by syringing	Maneb plus zinc sulfate, chlorothalonil, benomyl, thiophanate-methyl, thiophanate, thiophanate-methyl + mancozeb, triadimefon
Brown patch	*Rhizoctonia solani*	All major turfgrass species	Reduce nitrogen. Remove "dew." Increase air movement.	Mancozeb, maneb + zinc sulfate, chlorothalonil, anilazine, cycloheximide + thiram, benomyl, thiophanate-methyl, thiophanate, thiram, thiophanate-methyl + maneb, cadmium compounds, thiophanate + thiram, PCNB, iprodione, vinclozolin
Dollar spot	*Lanzia spp.* *Moellerodiscus spp.*	Annual bluegrass Bahiagrass Bermudagrass Centipedegrass Colonial bentgrass Creeping bentgrass Fine-leaf fescues Kentucky bluegrass Perennial ryegrass St. Augustinegrass Zoysiagrass	Increase nitrogen. Remove "dew".	Benomyl, thiophanate, thiophanate-methyl, chlorothalonil, anilazine, cycloheximide + PCNB, cadmium compounds, thiophanate + thiram, thiram, thiabendazole, benomyl, iprodione, thiophanate-methyl + maneb, vinclozolin, triadimefon
Fusarium blight syndrome		Kentucky bluegrass Centipedegrass	Light, daily watering during the summer.	thiophanate-methyl, thiophanate, triadimefon
Helminthosporium Diseases	*(Dreschlera)*			
Brown blight	*D. siccans*	Ryegrass	Remove clippings. Raise cutting height. Plant resistant cultivars. Moderate spring nitrogen. Daily irrigation	Mancozeb, chlorothalonil, cycloheximide, anilazine, maneb + zinc sulfate, cycloheximide + thiram, cycloheximide + PCNB, iprodione, vinclozolin
Leaf blotch	*D. cynodontis*	Bermudagrass Bentgrass, Fine-leaf fescue, Kentucky bluegrass		
Leaf spot	*D. sorokinianum*			
Melting-out	D. poae	Kentucky bluegrass		
Net-blotch	D. dictyoides	Fescue		
Red leaf spot	D. erythrospilum	Creeping bentgrass		
Stem and Crown Necrosis	D. spiciferum	Bermudagrass		
Zonate eye spot	D. giganteum	Bermudagrass		
Gaeumannomyces patch (Take all patch)	*Gaeumannomyces graminis*	Annual bluegrass Colonial bentgrass Creeping bentgrass Kentucky bluegrass Tall fescue Velvet bentgrass	Reduce soil pH. Avoid liming. Use acidic fertilizers. Sulfur.	None.
Pythium blight (cottony blight)	*Pythium* spp.		Improve soil drainage. Increase air circulation.	Chloroneb, ethazole, metalaxyl, propamocarb, hydrochloride
Red thread	*Laetisaria fusiformis*	Creeping bentgrass Colonial bentgrass Bermudagrass Annual bluegrass Perennial ryegrass Fine leaf fescues	Increase nitrogen	anilazine, iprodione, triadimefon, vinclozolin, chlorothalonil
The Snow Molds				
Typhula blight	*Typhula* spp.	Annual bluegrass Colonial bentgrass Creeping bentgrass Fine-leaf fescues Kentucky bluegrass Perennial ryegrass Tall fescue Velvet bentgrass	Avoid early fall nitrogen fertility that leads to lush growth.	Mercury compounds, PCNB products, chlorothalonil, chloroneb. These products may have to be used in combination for effective snow mold management. Benomyl, Iprodione or Mancozeb will control *Gerlachia* patch where it occurs alone.
Gerlachia patch	*Gerlachia nivalis*			
Yellow patch	*Rhizoctonia cerealis*	Kentucky bluegrass Creeping bentgrass	Nitrogen to promote recovery.	Iprodione

*The order in which fungicides are presented does not imply the order of their effectiveness.

thracnose during heat stress periods of the summer. This is not due to heat alone, as was once believed. If proper cultural management is followed, and effective fungicides are used, annual bluegrass will survive the summer heat stress period like any other perennial.

Good cultural practices consist of deep vertical mowing early in the spring, as soon as growth is initiated for the season. This will allow for the production of new juvenile growth which should be more resistant to heat stress. This should be followed by coring a week or two later for good root growth. A second coring should be made following heavy seedhead production in the late spring to provide an optimum medium for maximum root growth (the coring holes) in the few remaining weeks prior to the heat stress period. More than 70% of the annual bluegrass roots disappear during heavy seedhead production. If only one coring a year can be done, this is the time to do it. A third coring should be made when the cool nights return in late summer and early fall.

Light nitrogen application should be made (i.e. 1/2 lbs. actual nitrogen per 1000 sq ft.) in June, July and August. This produces healthier annual bluegrass and reduces the amount of inoculum produced by *C. graminicola* for subsequent infection during the remainder of the anthracnose season. Finally, one of the effective fungicides should be used to insure healthy turf.

A computer model has been developed, which predicts the occurrence of anthracnose based on average daily temperatures and continuous hours of leaf wetness. Fungicides for the management of anthracnose can now be applied when the disease occurs instead of on a calendar basis.

Snow molds

There are two prevalent snow molds in the United States: *Typhula blight* (gray snow mold) and *Gerlachia patch* (pink snow mold).

Gerlachia patch Gerlachia patch is caused by *Gerlachia nivalis*, formerly known as Fusarium patch caused by *Fusarium nivale*. Yes, another name change and this time, they not only changed the scientific name of the organism causing the disease, but the common name of the disease as well!

The disease becomes a problem in the fall when the temperature drops into the low 60's and continues through the spring, until daytime temperature climbs back into the seventies. It is usually first noticed in the shaded areas of the green, tees and fairways.

Gerlachia patch does not need snow cover to become active, only the cool wet weather. Annual bluegrass is especially susceptible to Gerlachia patch.

In the spring the disease is often misdiagnosed as copper spot, because of the small copper-colored spot that it causes. However, copper spot is a disease that occurs in warmer weather. Keeping nitrogen at low levels during the time when Gerlachia patch may be active is important in helping manage the disease

Typhula blight

Typhula blight is caused by two species, *Typhula incarnata* and *T. ishikariensis*. *T. incarnata* is the primary species in eastern, southern, and regions of the midwest and western U.S. *T. ishikarienis* is most prevelant in the more northern snow mold regions, especially where prolonged periods of permanent snow (two or more months) exist in the mid-western and western U.S.

The two typhula species are easily distinguished from each other when observed soon after the snow melts. *T. incarnata* produces grayish spots in the turf, with fairly large uncommon brown sclerotia (a mass of filaments) evident. Whereas, *T. ishikariensis* spots have a reddish cast and contain small, dark black sclerotia. Typhula blight only occurs under snow cover. It does not occur in the cool wet weather of fall and spring, except under leaf piles.

Knowing which species you have is important in chemically managing the disease. Many fungicides, including the mercuries, chloroneb(Teremec SP), PCNB(Terraclor), triadimefon(Bayleton), and chlorothalonil(Daconil) will manage Typhula blight caused by *T. incarnata*. They do not all manage Typhula blight caused by *T. ishikariensis*.

The picture also is more confusing state by state. For example, in Michigan, the mercuries, PCNB, and chlorothalonil will manage both species, but triademefon and chloroneb will not manage Typhula blight caused by *T. ishikariensis*. In northern Wisconsin and Minnesota, combinations of the mercuries and PCNB are required to manage both species. You should check with your local turfgrass experts to find out the fungicides that are effective in your area.

Gaeumannomyces patch

Gaeumannomyces (take all) patch caused by *Gaeumannomyces graminis var. avanea* was formerly known as Ophiobolus patch caused by *O. graminis*. This disease was originally thought to be confined to the Pacific northwest. It has now been reported in the coastal areas of New England, New York, and the mid-Atlantic states, primarily on creeping bentgrass turfs. A Gaeumannomyces like organism has also been reported on annual bluegrass in the mid-eastern and midwestern U.S.

In 1983, the disease caused widespread destruction on many annual bluegrass fairways in mid-August and early September. So, Gaeumannomyces patch or closely related diseases are now occurring through most of the cool-season grass regions of the United States.

Lowering the pH through the use of sulfur still appears to be the best way to manage this disease. A word of caution is necessary, the granular sulfur products have been observed to cause injury to the turf the season following application. This injury initially resembles dollar spot. The sprayable sulfurs are just as effective and do not have the bad side effects.

Fusarium blight

There are two current schools of thought on the cause of Fusarium blight. The research at Penn State University (Cole) suggests that a basidiomycete (a type of higher fungi) is involved in causing the "frog-eye" symptom associated with Fusarium blight and that, if the Fusarium fungi are involved at all, they are involved as saprophytes colonizing the dead and dying tissue.

The other school of thought, represented by Cornell University (Smiley) suggests the cause of the "frog-eye" is due to two fungi, *Leptospheria korrae* and/or *Phiolophora graminicola*. It could be we are actually dealing with three different fungi causing three different diseases, all of which have the same symptom. Time will tell which of these schools of thought are correct or if they both are.

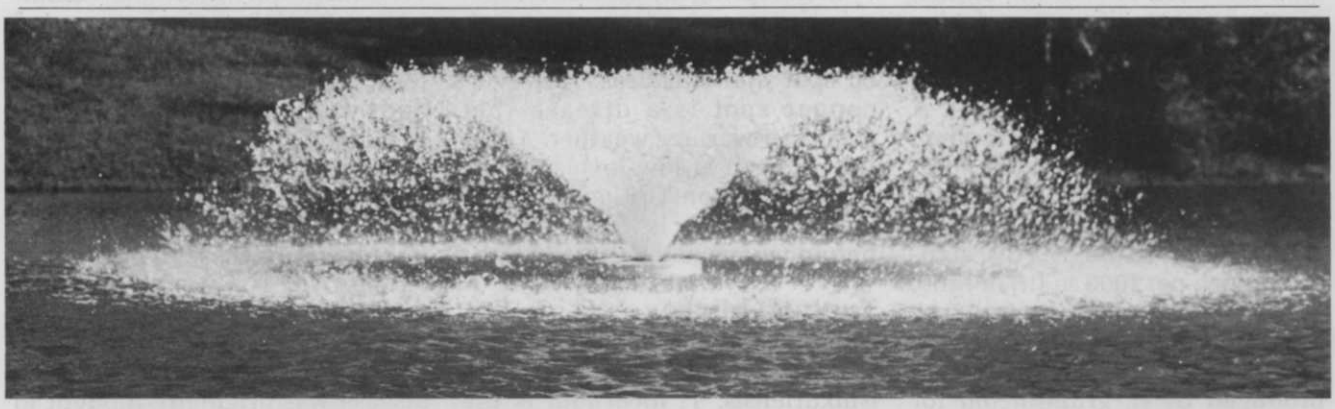
Fusarium blight is a warm weather disease that occurs from late June through early September depending on your location. The disease usually occurs after a week or two of dry weather following a heavy rain.

The characteristic initial symptom is wilted turf in the infected spot. This separates it from six other diseases that have similar "frog-eye" symptoms, like brown patch and yellow patch.

Since there may be as many as three fungi involved in the Fusarium blight syndrome, it is difficult to make specific recommendations to encompass all of them. The following are the best management recommendations available, although slight variations may exist in different areas of the country.

Cultural management Coring should be done to improve root development, reduce thatch, and eliminate layering caused by two different soil types. Homelawn turf is often grown on poor soil. Many times sod is layed on compacted subsoil because the topsoil was removed during construction.

Nutrient and water uptake are active processes which require adequate oxygen. Coring holes provide an excellent area for root growth with good aeration for proper uptake of nutrients and water.



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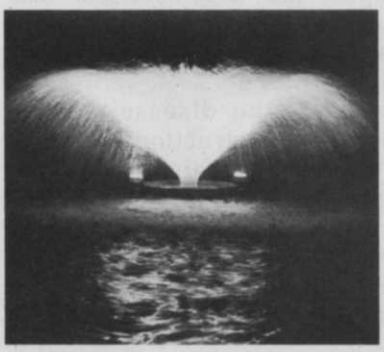

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Photo: Peter B. Kaplan

If you still believe in me, save me.

For nearly a hundred years, the Statue of Liberty has been America's most powerful symbol of freedom and hope. Today the corrosive action of almost a century of weather and salt air has eaten away at the iron framework; etched holes in the copper exterior.

On Ellis Island, where the ancestors of nearly half of all Americans first stepped onto American soil, the Immigration Center is now a hollow ruin.

Inspiring plans have been developed to restore the Statue and to create on Ellis Island a permanent museum celebrating the ethnic diversity of this country of immigrants. But unless restoration is begun now, these two landmarks in our nation's heritage could be closed at the very time America is celebrating their hundredth anniversaries. The 230 million dollars needed to carry out the work is needed now.

All of the money must come from private donations; the federal government is not raising the funds. This is consistent with the Statue's origins. The French people paid for its creation themselves. And America's businesses spearheaded the public contributions that were needed for its construction and for the pedestal.

The torch of liberty is everyone's to cherish. Could we hold up our heads as Americans if we allowed the time to come when she can no longer hold up hers?

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You are invited to learn more about the advantages of corporate sponsorship during the nationwide promotions surrounding the restoration project. Write on your letterhead to: The Statue of Liberty-Ellis Island Foundation, Inc., 101 Park Ave, N.Y., N.Y. 10178.

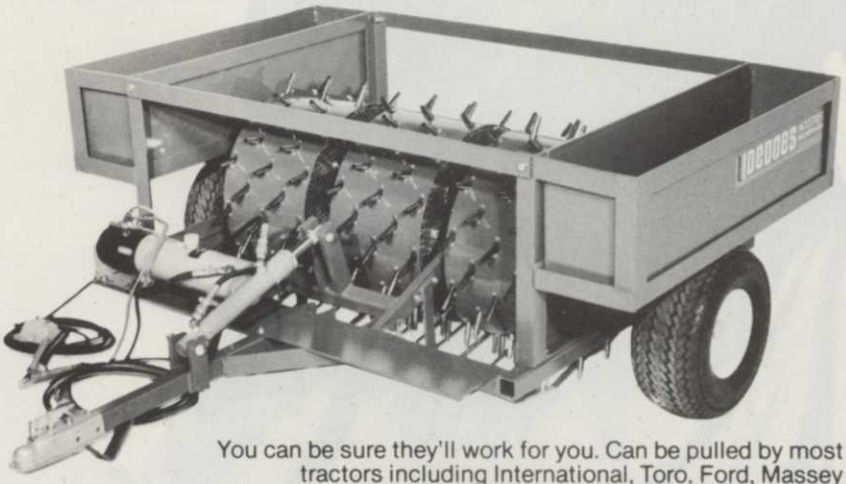
KEEP THE TORCH LIT

Save these monuments. Send your personal tax deductible donation to: P.O. Box 1986, New York, N.Y. 10018. **The Statue of Liberty-Ellis Island Foundation, Inc.**

Thatch reduction is best accomplished during the coring operation by breaking up the cores with a vertical mower or power rake, and incorporating the soil back into the thatch layer. Power raking does little for thatch reduction. It removes leaf tissue which is readily broken down but does nothing to remove the rhizomes and roots which are primarily responsible for thatch formation.

Layering results from one soil of a different type being placed on top of the other, as when a muck sod is placed on mineral subsoil.

Trailer aerator/dump box package by Dedoes: easy, quick and effective.



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In the cool weather of spring and fall it may not be a problem, but under stress conditions of the summer it can become a serious problem. The entire turfgrass root system is restricted to the upper layer during the summer heat stress period. This often means the root systems are no more than an inch in depth.

Obviously, drought stress diseases like "Fusarium blight syndrome" are going to be more severe under such conditions.

Integrating two soil layers over a period of years through a coring program should make for a deeper rooted, healthier turf.

Fertility Nitrogen fertility in the summer months of June, July and August, will reduce the severity of the "Fusarium blight syndrome". Approximately 1/2 lb. of actual nitrogen/1,000 sq ft./month should be adequate.

Irrigation Supplemental irrigation can culturally reduce "Fusarium blight syndrome" if applied on a daily basis. If applied at mid-day it will cool the plants, similar to syringing performed on golf courses during the heat stress period. It also provides water for the short and limited root systems of the infected plants.

If the mat or thatch is kept moist, antagonistic microorganisms may develop, which will prevent the pathogenic fungi from attacking the plants. A daily irrigation program during the summer on infected turf may also cause the build-up of antagonistic microorganisms that destroy the "Fusarium blight syndrome" fungi.

Chemical management Thiophanate(Cleary's 3336), thiophanate-methyl(Fungo 50) and benomyl(Tersan 1991), are good fungicides for the management of the "Fusarium blight syndrome". They all have the same basic chemistry.

The turf area to be treated should be irrigated the night before and the fungicides drenched in before they dry on the foliage. They can be used either cura-

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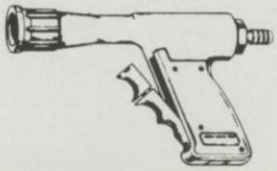

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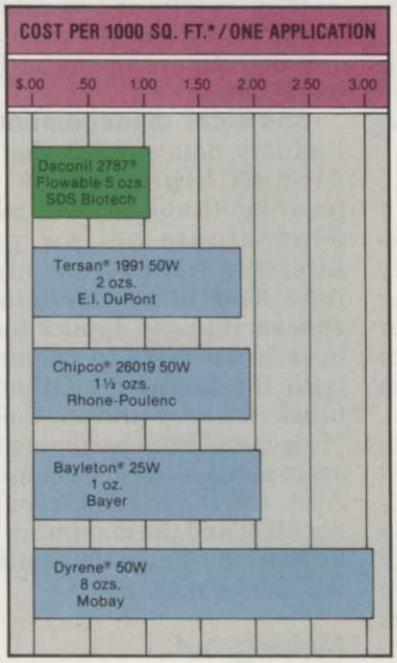

*Costs based on manufacturer suggested retail unit price as of January, 1984.

What's more, in over 15 years of continuous use, there has never been a documented case of resistance with Daconil 2787. Even on courses where it was applied at weekly intervals over many years.

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tively or preventively.

The fourth fungicide, triadimefon(Bayleton), does not have to be drenched in to be effective. However, it does have to be used preventively. This means it has to be applied before the disease becomes active during the current season. This does not mean Bayleton cannot be used on turf areas that had the "Fusarium blight syndrome" the year before, only that it must be used before the disease becomes active this season.

Since more than one fungus appears to be involved in this syndrome, future research may indicate a difference in the effectiveness of these fungicides on the various fungi causing "Fusarium blight syndrome".

Yellow patch

Yellow patch is caused by *Rhizoctonia cereales* and is a newly recognized disease of Kentucky bluegrass. This is a cool weather disease that occurs in September through November, depending on your location.

The initial symptoms are red to purple leaves on the infected plants. The disease is characterized by "frog- eyes" which resemble the "Fusarium blight syndrome". Consequently, the disease is often mis-identified as Fusarium blight. The main differences between the two diseases are "Fusarium blight syndrome" occurs in warm weather and is characterized by wilting turf in the active spots, whereas yellow patch occurs in the cool weather of the fall and is characterized by the red blades on the infected grass plants.

Cultural management Nitrogen fertility during the growing season is necessary for recovery of the older yellow patch "frog-eyes" that were formed in previous seasons. The effect nitrogen has on development of new yellow patch "frog-eyes" has not been determined.

There are some products which claim to change the chemical and biological activity of soil and thatch to make it a better environment for biological activity of beneficial microorganisms and healthier plant growth. Several products were tested for their management of Rhizoctonia yellow patch and some promoted excellent recovery of older yellow patch "frog-eyes" and prevented new ones from forming. They were Lawn Keeper and Green Majic. It is important to point out these are only preliminary findings and further research is needed to check the repeatability of these results and to determine rates, timing and the exact effect the products are having on disease reduction.

Chemical management Preliminary data suggest that iprodione(Chipco 26019) and fenarimol(Rubigan) will manage Rhizoctonia yellow patch. Effective timing and minimal rates have to be determined. It appears nitrogen application will have to be made in conjunction with the fungicide. Otherwise, fungicides may prevent the older "frog-eyes" from becoming active again and new ones from forming. Also, the older "frog-eyes" will not fill in and the maximum benefit from the fungicide treatments will not be realized.

Melting-out

This disease is often incorrectly referred to as leaf spot. To be correct, melting-out is caused by *Dreschlera poae*(formerly *Helminthosporium vagans*) and is a disease of Kentucky bluegrass that occurs in the cool, wet weather of spring. The disease starts out as spots on the leaf blades and in a 2-3 week period, rapidly moves down the leaf sheath and into the crowns and roots. The entire grass plant is often killed or severely damaged during this period, which is where the term melting-out arises. The entire stand of Kentucky bluegrass seems to melt away.

Leaf spot, on the other hand, is a warm weather disease of many grass species caused by the fungus *Drechslera sorokinianum* (formerly *Helminthosporium sativum* and sometimes currently referred to as *Bipolaris sorokinianum*). Are you thoroughly confused now? Don't feel bad, you're not alone.

There are many Kentucky bluegrass cultivars that are resistant to melting-out. The first resistant cultivar was 'Merion' which had excellent resistance to melting-out. Some of the newer Kentucky bluegrass cultivars, i.e. Parade, Baron, Cheri, Majestic, etc., have some resistance to melting-out, although it is not the same excellent resistance 'Merion' had. Consequently, stands of some of the newer Kentucky bluegrass cultivars may be thinned by melting-out in the spring, allowing for invasion by crabgrass, quackgrass, tall fescue and/or broadleaf weeds. This means cultural, biological and chemical management practices to reduce the severity of melting-out will have to be incorporated into your turf management programs.

Helminthosporium melting-out is one of the oldest, most written about, turfgrass diseases. Unfortunately, much of what has been written about the disease, is based on "folk law" and not good scientific data.

First, much of the older literature refers to melting-out having a "leaf spot stage" in the spring, during the cool, wet weather and a "melting-out stage" during the hot weather of the summer. Anyone who is familiar with the disease knows all the damage is done during the cool, wet weather of spring. With the arrival of warm weather the turf begins to recover.

Secondly, practically all the literature says to avoid spring nitrogen, because it will increase the severity of Helminthosporium melting-out. It appears the research that lead to the erronious conclusion was based on greenhouse data and not field. At Michigan State University, data from

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TURF

the last four years suggests just the opposite. Nitrogen in the spring actually reduces the severity of Helminthosporium melting-out. We recommend two nitrogen applications during the spring period to help manage Helminthosporium melting-out. Each applicatioon should be between 1/2-1 lb. of actual nitrogen/1000 sq. ft.

The third management practice is biological in nature. It consists of daily irrigation to keep the mat or thatch moist, to encourage the build up antagonistic microorganisms that prevent the fungus D. poae from sporulating, or germinating, or infecting. There is also a possibility that these antagonistic microorganisms may even destroy D. poae. While the details have not been worked out, the results have shown a dramatic reduction in the amount of Helminthosporium melting-out, where light daily irrigation has been applied.

The actual concept may be hard to grasp since the disease occurs under cool, wet weather conditions, but apparently just a few days without rain, allows the top of the thatch to become dry and allows the D. Poae fungus to grow and infect these grass plants. You aren't irrigating the turf, you are irrigating the thatch to keep it moist.

Following good cultural and biological practices will help improve the disease management obtained with the fungicides. For the people in the lawn care business, there are now three excellent fungicides which will manage Helminthosporium melting-out during the 3-4 weeks it is normally a problem in the spring; iprodione(Chipco 26019), vinclozolin(Vorlan), and chlorothalonil(Daconil). There is a possiblity that anilazine(Dyrene) may also manage the disease for the desired period of time, although more research is needed. Remember, applying these fungicides with a little nitrogen will make them more effective. **WT&T**

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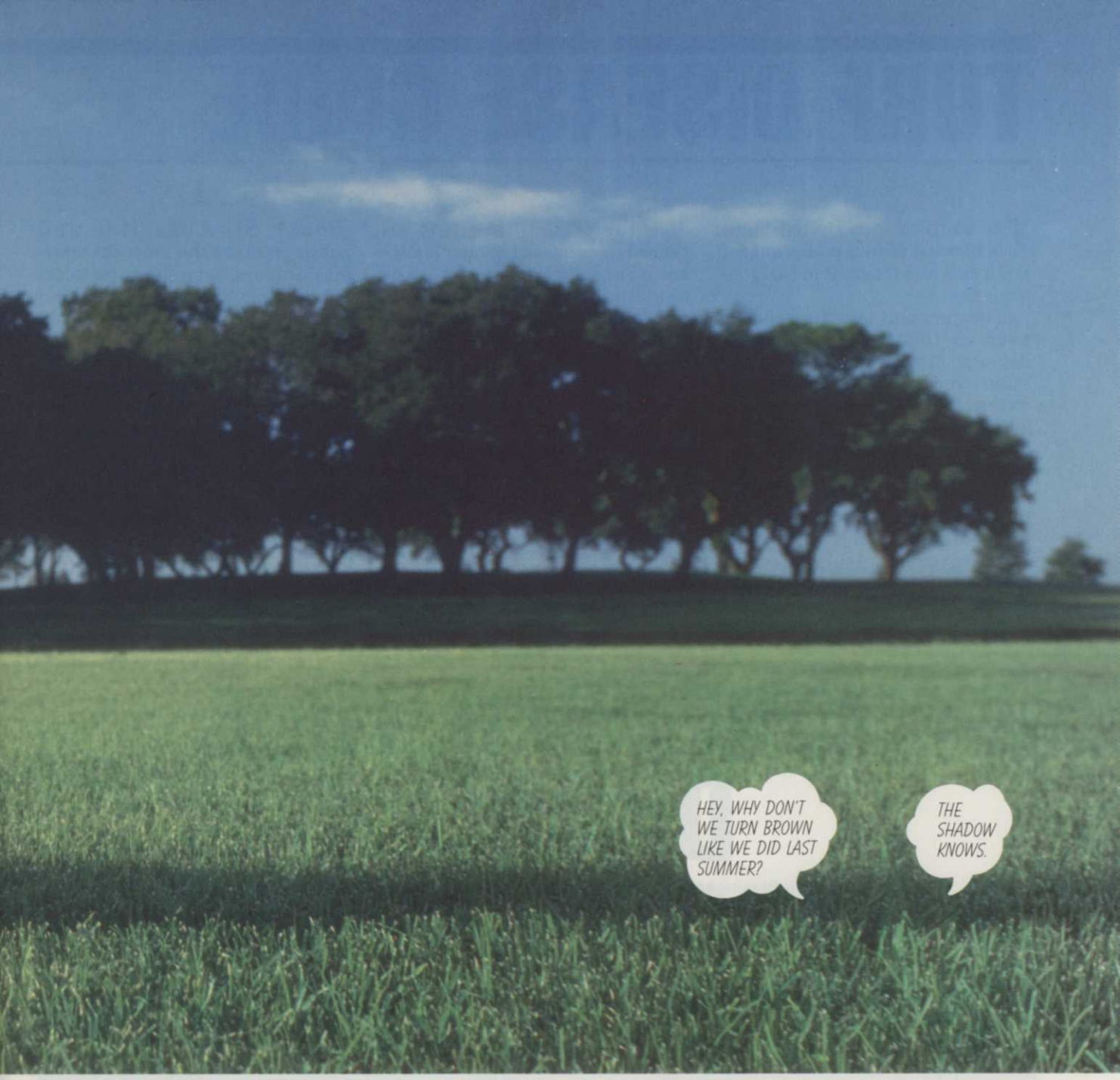

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TURF DISEASE GUIDE

Southern Turf Diseases

by Don Blasingame, extension plant pathologist, Mississippi State University

The southeastern United States is blessed with a wide range of choices when it comes to turfgrass varieties.

The predominant turf species used in this region is bermudagrass; however, there are five other warm season grasses used extensively for turf purposes. These include St. Augustine, zoysiagrass, centipedegrass, carpetgrass and bahiagrass.

During the winter months, when warm season grasses are brown and dormant, various annual and perennial turfgrasses are used as temporary overseeded grasses.

Although most of the serious diseases of southern turf are caused by fungi, other agents such as bacteria, viruses, and nematodes can cause serious problems to certain grasses.

Turf producers in the south cannot depend solely on fungicides for disease control. Good variety selection, cultural and fertility practices are very important in disease control. No amount of fungicide will compensate for poor fertility and cultural practices.

Brown patch

Brown patch is the most common turf disease occurring in the southeastern United States. Although St. Augustine and zoysiagrass are the most susceptible cultivars, even the more tolerant centipede, bermudagrass and ryegrass are frequently damaged by this fungus.

Brown patch is favored by warm, moist weather when nighttime temperatures are relatively cool. Therefore, in certain areas of the south, brown patch can and does occur any month of the year.

In the upper regions of the south the most favorable conditions for disease development usually occur from late April through mid-October.

Symptoms of brown patch on warm season grasses are some-

what different from the symptoms that are described for cool season grasses. Even though the grass is usually killed in a circular pattern, many times the characteristic smoke ring is not seen on southern turf. Also, under certain environmental conditions the fungus may cause a gradual thinning of the turf over a rather large area instead of killing in a circular pattern.

There are several factors that tend to make the grass more susceptible to brown patch. One of these is the excessive application of nitrogen fertilizer. This promotes a lush growth of grass that is readily attacked. Another condition that leads to severe disease development is watering late in the afternoon and allowing the grass to remain wet for long periods of time. The excessive accumulation of thatch creates a most favorable environment for development of brown patch and many other diseases that are caused by fungi.

Fungicides are best used on a preventive schedule. Once symptoms develop control can be difficult.

Dollar spot

Dollar spot is a fungus disease common in the southeast on many species of grasses, particularly on bentgrass, bermudagrass, zoysiagrass, and annual and perennial bluegrasses.

Dollar spot is a disease in which symptoms are different on certain warm season grasses than those noted on cool season grasses.

On the finer textured grasses, such as bermudagrass and zoysiagrass, the grasses are killed in small patches two to three inches in diameter. Under severe conditions these patches may coalesce so that the turf has a mottled appearance. Blades of grass at the outer edges of the infected area develop tan spots with reddish-brown margins.

On the coarser warm-season grasses the turf is killed in larger patches that may range up to a foot in diameter.

Dollar spot is prevalent during periods of mild weather during the spring and fall months. Unlike brown patch, dollar spot is retarded by high levels of nitrogen fertilizer.

Because excess nitrogen tends to favor the development of brown patch and other diseases, discretion must be used in applying nitrogen. Watering should be performed only in the early morning so the foliage can dry quickly. Fungicides can be used to help bring the diseases under control once it gets established.

Brown patch *is the most common turf disease in the Southeast. It affects primarily St. Augustine and zoysiagrass in the South and bentgrass and perennial ryegrasses in the North. It is prevalent during warm, moist days with cool nights.*

Spring dead spot *attacks bermudagrass and zoysiagrass while dormant, becoming evident during spring greenup.*

Leaf spots

There are a number of fungi that cause leaf spots on many of the southern grasses. Regardless of the causal agent, these leaf spots on southern grasses are similar and so are the control measures.

Helminthosporium leaf spots (Melting Out) Bermudagrass and ryegrass are most severely affected by helminthosporium infections, although the fungus can survive on centipedegrass and St. Augustine.

Infection can occur over a wide range of temperature but usually is more severe when temperatures are 70° to 95°. Milder temperatures in the spring and fall are more favorable for infection.

Helminthosporium causes small, dark colored spots or flecks on the leaves and sheaths. Leaf spots are usually more numerous near the collar of the leaf blades. Severely affected leaves wither and die and the turf frequently becomes brown and thin.

Symptoms on overseeded ryegrass are altogether different. Although leaf spots may occur, this same helminthosporium can cause severe crown rot. This causes a yellowing and discoloration of the grass and a general

thinning of the turf.

Fertilize with adequate levels of nitrogen and potassium if helminthosporium diseases become a problem. With careful management, apply fungicides recommended for helminthosporium blight control.

Gray leaf spots St. Augustine is the primary host for gray leaf spot. The disease occurs throughout the lower south during warm, humid weather.

Spots on the leaf blades are the most visible symptom but sheath and stem lesions also occur. Leaf spots begin as olive green to brown, water-soaked spots as small as a pin head. These enlarge rapidly and form a circular to elongate lesion that are brown to ash colored with purple margins.

The disease occurs during moderate to warm weather accompanied by high relative humidity. Severity of the disease is enhanced by applications of nitrogen fertilizer and is more of a problem in shaded areas where the grass remains wet from dew.

Treatment with a fungicide may become necessary if the disease outbreak is severe and accompanied by prolonged periods of wet favorable weather.

Rust

Puccinia species infect a number of grasses grown in the south, including ryegrass, zoysiagrass, bluegrass, fescue, bermudagrass and St. Augustine. Zoysiagrass and bluegrass are the most often affected grasses.

Susceptibility varies with the variety. Fungus infection is favored by minimum and maximum temperatures of 50° to 70° F. respectively. For this reason, the disease does not usually cause severe damage over an extended period. It is likely to be more severe in shaded areas during rainy, humid weather. Affected turf will appear unthrifty and begin to thin.

The disease is characterized by the presence of pustules on the leaf blades. These pustules range from bright orange to cinnamon-brown in color depending upon the species of fungus present.

Certain varieties of ryegrass are extremely susceptible to rust and sometimes severe damage can occur. On warm season grasses, zoysiagrass, especially Meyer and Emerald varieties, are most severely affected by rust.

Fertilize to stimulate grass growth, mow on a four to five day schedule and catch clippings. If necessary, a fungicide may be applied to help reduce the amount of disease present.

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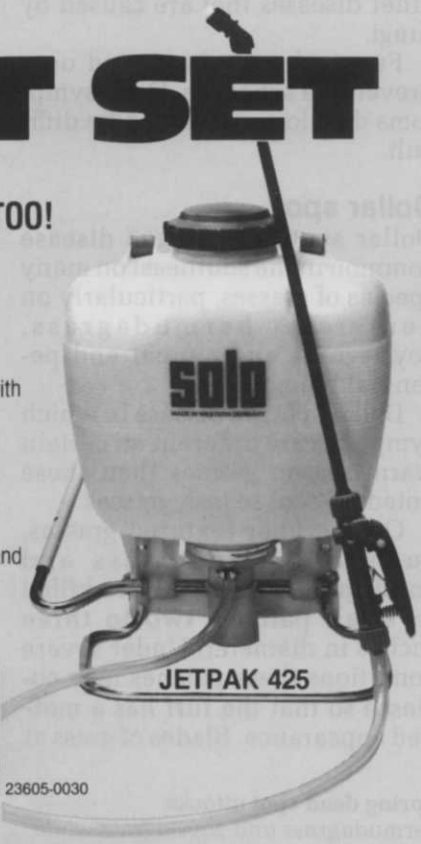

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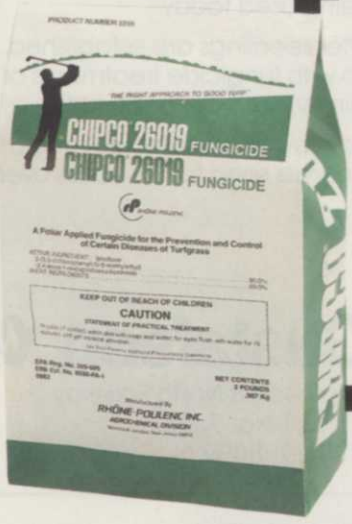
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TURF

Spring dead spot

Spring dead spot is a serious disease of bermudagrass in certain parts of the upper Sunbelt. Generally speaking, it is found on bermudagrass or zoysiagrass under high maintenance.

Damage to the turf apparently occurs during the dormant season, and when greenup occurs in the spring, there are areas a few inches to several feet in diameter where the sod is completely dead.

The causal agent for spring dead spot has not been identified. The only control procedures recommended at the present time are good cultural practices and limiting the use of nitrogen fertilizer especially late in the growing season.

Research has shown that fungicides can limit the damage. However, at the present time only two fungicides are labeled and these may be limited to use in certain states.

St. Augustine decline

St. Augustine decline (SAD) is caused by a virus. It causes a mosaic-type of chlorosis of the leaf blades that may resemble a nutrient deficiency or mite feeding. Evidently there are several strains of the virus since there is a great range in damage to St. Augustine.

To this point, the disease has only been recorded in Arkansas, Texas, Louisiana and Mississippi. There are no chemicals available for the control of this disease.

There are several varieties of St. Augustine that are resistant to the virus and can be used in areas where the disease is a potential problem. Floratam was the first variety released that has resistance to SAD. It is also resistant to chinch bugs. It has poor cold tolerance and should be used only in the lower south. Seville is resistant to SAD and is more shade tolerant than common St. Augustine. Raleigh is resistant to SAD and has good winter hardiness.

Downy mildew of St. Augustine

Downy mildew of St. Augustine was first described on common St. Augustine in Texas in 1969. Since then the disease has spread and has been identified in Arkansas, Louisiana and Mississippi.

Downy mildew appears as white, raised, linear streaks that develop parallel to the mid-veins of the leaf. Streaks appear in the spring and remain throughout the summer, giving the leaves a yellow appearance with some death toward the tips. Severe dis-

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ease occurs in grass that is grown in flood plains or poorly drained areas.

The white-streak symptom in early stages is easily confused with the virus disease, St. Augustine decline. However, the virus symptoms are more yellow in color and more mottled than striped.

Downy mildew has been difficult to control with most common turf fungicides. The cultural practices recommended for control are to maintain good drainage so that no free water stands on areas where St. Augustine is grown.

Fairy rings

Fairy rings generally appear in lawns and other turf areas as circles or arcs of dark-green, fast-growing grass during the spring and early summer. A ring of thin dead grass may develop on one or both sides of this circle.

The disease is caused by one of several soil-inhabiting fungi that commonly produce mushrooms. Mushrooms that sometimes appear in the ring are the fruiting bodies of these fungi. Stimulation of the grass is due to the release of nutrients from the organic breakdown of the thatch by the growing fungus.

It is difficult to control fairy ring. Two general approaches may be considered. The first is removal. Remove infected grass and soil to a depth of 12 inches or more in a band several feet on each side of the affected area and replace with clean soil.

Another approach is to suppress the disease. For low maintenance grass areas, increase the water and fertilization program to stimulate the declining grass inside the ring.

Symptoms of the ring can be masked by pumping large quantities of water into this area. There are no chemicals labeled for the control of this disease.

Slime molds

Slime molds are a group of organisms which create considerable concern among gardeners and those interested in maintaining a good quality turf. These molds cover above-ground plant parts with a dusty gray-black or dirty yellow mass.

When you look closely at this growth you see small round balls scattered over the plant. If you rub these between your fingers a sooty-like powder emerges. This sooty-like powder is the spores of the fungus.

Slime molds normally live in the soil where they feed on decaying organic matter. When the

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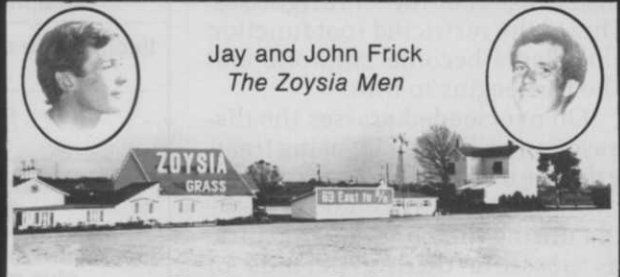

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slime mold is ready to reproduce, it grows up on to the grass blades so that the spores may be spread great distances. Its only purpose of selecting plant parts above the soil line is to distribute the spores over a further distance than it would be able to from the soil surface.

Slime molds do not feed on living plants. They only use them for support during reproduction.

Slime molds occur during wet weather throughout the spring, summer and fall. They disappear rapidly as soon as it becomes dry and chemical control is usually not necessary.

Pythium blight

Pythium blight can be a devastating disease on overseeded ryegrasses; however, bermudagrass and the other warm-season grasses can be affected to a lesser degree.

An abundance of moisture is required for pythium blight development. In addition, the disease is favored by warm temperatures.

Affected grass is killed rapidly in spots two to four inches in diameter. These spots may develop into streaks so that large areas of turf are damaged.

During early stages of development the affected grass appears wilted and greasy. At times the affected turf spots may have a cottony appearance due to the abundant growth of the fungus. For this reason the disease is frequently referred to as cottony blight.

Certain species of pythium can also cause root rot on turfgrasses. Due to the restricted root function the plants become chlorotic and the turf begins to thin.

On overseeded grasses the disease can be limited by using treated seed and delaying the overseeding until as late as possible during the fall. Water as little as possible during periods of favorable disease activity. The perennial ryegrasses are not as susceptible as annual. Under severe disease pressure chemical control may be required. **WT&T**

Turf Fungicide Directory

Common Name	Brand Name	Company	Circle No.
anilazine	Dymec 50	Gordon	201
	Dyrene	Mobay	202
	Ortho Dyrene	Ortho/Chevron	203
	Proturf Fung. III	Scotts	204
benomyl	Proturf Fung. DSB	Scotts	205
	Tersan 1991	Du Pont	206
cadmium	Caddy	Cleary	207
	Cadtrete	Cleary	208
	Cadminate	Mallinckrodt	209
	Kromad	Mallinckrodt	210
chloroneb	Proturf Fung. II	Scotts	211
	Teremec SP	Gordons	212
	Terreneb SP	Kincaid	241
chlorothalonil	Daconil 2787	SDS Biotech	213
	Proturf 10IV	Scotts	214
cycloheximide	Acti-dione TGF	Tuco/Upjohn	215
ethazol	Koban	Mallinckrodt	216
	Terrazole	Olin	217
fenarimol	Rubigan	Elanco	218
iprodione	Chipco 26019	Rhone Poulenc	219
	Proturf Fung. 6	Scotts	220
mancozeb	Fore	Rohm and Haas	221
	Formec 80	Gordons	222
maneb	Tersan LSR	Du Pont	223
mercuries	Calo-Clor	Mallinckrodt	224
	Calo-Gran	Mallinckrodt	225
metalaxyl	Subdue	Ciba Geigy	226
PCNB	Terraclor 75	Olin	227
PMA(PMAS)	PMA, PMAS	Cleary	228
PMA plus Thiram	Proturf Broad Spectrum Fung.	Scotts	229
propamocarb	Banol	Tuco/Upjohn	230
thiophanate	Cleary's 3336	Cleary	231
thiophanate methy	Fungo 50	Mallinckrodt	232
	Proturf Systemic	Scotts	233
thiram	Chipco Thiram 75	Rhone Poulenc	234
	Spotrete	Cleary	235
thiophanate plus thiram	Bromosan	Cleary	236
thiophanate-methyl plus maneb	Duosan	Mallinckrodt	237
triadimefon	Bayleton	Mobay	238
	Proturf Fung. 7	Scotts	239
vinclozolin	Vorlan	Mallinckrodt	240

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Kentucky Bluegrasses and Their Culture

by C. Reed Funk, professor of turfgrass breeding, and **R. E. Engel**, professor of turfgrass management, Cook College, Rutgers University, New Brunswick, NJ

Selection of turf seed can make a huge difference in the appearance and maintenance requirement of a turf area. Differences between varieties are significant to the professional. Keep this article and the next two parts of the seed series, as a reference for future seed purchases.

Kentucky bluegrass, *Poa pratensis* L., is the most important lawn grass in the northern half of the United States. It is hardy, aggressive, persistent, attractive and widely adapted.

New lower-growing Kentucky bluegrass varieties have been developed which produce a more attractive, durable, persistent turf under a wide range of environmental conditions. These are making this species more useful to the turfgrass industry.

Origin and adaptation

Kentucky bluegrass is native to the Old World and occurs naturally throughout the temperate regions of Europe and Asia. Early colonists brought the grass to North America in seed mixtures, hay and bedding. It was disseminated rapidly by men, birds and other animals.

Much of the bluegrass found on millions of acres of fertile pastures, roadsides, and other open areas developed without seeding by man. Its ability to colonize is one reason for its widespread occurrence.

Like other cool-season grasses, Kentucky bluegrass grows best during the cool months of spring and fall. Studies at Beltsville, MD, and Kingston, RI, have shown some root growth will occur throughout much of the winter in unfrozen soil if fertility and soil pH are adequate.

With prolonged summer drought, Kentucky bluegrass may become dormant and turn brown. However, it usually recovers and resumes growth quickly with the return of cooler temperatures and favorable soil moisture. Instances of poor recovery from summer drought are usually associated with insects, thatch, excessive density, insufficient rhizomes, disease, and management practices which include excessive applications of nitrogen fertilizer and/or close mowing.

The development of Kentucky bluegrass varieties with greater tolerance to the long hot summers of the transition zone from Southern New Jersey, Washington, D. C., Cincinnati, Louisville, St. Louis and westward is a real challenge to the turfgrass breeder.

Kentucky bluegrass is best adapted to well-limed, fertile loam soils and cool exposures. In humid regions the soil pH should be corrected to 6.0 to 6.8 for optimum performance although some more acid tolerant cultivars, such as Fylking and Victa, may persist on soils with a pH slightly below 5.0. Under arid soil conditions in dry land areas Kentucky bluegrass thrives on soils having a pH as high as 8.0 if irrigation is provided.

Growth of Kentucky bluegrass is best on well-drained soils. However, it is considerably more tolerant of poor soil drainage than the fine fescues. Helminthosporium leaf spot and crown rot can be especially damaging to susceptible varieties on poorly drained soils.

Kentucky bluegrass is not as well adapted to the extremely sandy coastal plain soils as the fescues, or zoysiagrass unless such soils are properly modified with appropriate additions of organic matter, lime, fertilizer and use of some water. It is also moderately intolerant of excess salt accumulations.

A well-limed, vigorous Kentucky bluegrass sod is noted for increasing organic matter content and improving physical structure of soil. Nevertheless, excessive traffic and poor management may weaken the turf and favor the invasion of species more tolerant of compacted soil conditions such as *Poa annua* and knotweed. Friable soils of good physical condition enhance the ease of establishment of Kentucky bluegrass.

Fertility response

Kentucky bluegrass responds well to generous fall fertilization. Minimal spring and summer fertilization is usually best when

Off-type grass plants *in the field are killed by roguing crews (left), so the seed crop purity is maintained.*

Seedheads emerge *on Kentucky bluegrass (left), and later just prior to cutting and swathing in the field.*

summer stress is severe.

Turf should be fertilized primarily to improve color and density or to heal injury. This can be done most effectively from September through late fall. Short days and cool fall temperatures stimulate tiller production and root growth. They also reduce the rate of leaf blade elongation and cause the plant to grow in a more decumbent(spreading) manner.

In contrast, during the long days in May and June rapid leaf elongation of Kentucky bluegrass occurs and plants are upright.

Fertilizer applications in the fall do not increase mowing as much as the same fertilizer rates applied during the spring growing season. Also, sparce turfs typically increase their density more following fall fertilization. Late fall fertilization of Kentucky bluegrass promotes better winter color and also assures early spring green-up.

Excessive nitrogen, that stimulates Kentucky bluegrass in late spring and summer, prevents it from developing the physiologically-hardened condition that helps it survive heat and drought stress. Lush spring growth from high fertility also intensifies damage from the Helminthosporium leaf spot and crown rot disease.

In short, fall fertilization of turf causes less turf injury during stress, requires less mowing, gives adequate color and gives better turf density than spring fertilization.

Adaptation to shade

Kentucky bluegrass normally performs best in full sun and light shade. In warmer areas it may tolerate afternoon shading with good air movement. In fact, the cooling effect of light shade may reduce injury from chinch bugs, Fusarium blight, heat and drought. In warmer regions, Kentucky bluegrass normally does not occur in full sun.

Shaded areas with restricted air movement in wet climates result in slow drying of the turf and a hot humid microenvironment which weakens the grass and provides conditions favorable for disease development.

Moderate to heavy shading of Kentucky bluegrass reduces carbohydrate food reserves, restricts

Kentucky Bluegrass Varieties

Adelphi (Adikes, Jacklin) is a moderately low-growing, turf-type bluegrass with a very attractive, dark green color which is maintained throughout the entire growing season. It has shown good resistance to leaf spot, Fusarium blight, most races of stripe smut and rust and has moderate resistance to dollar spot. Adelphi is a hybrid between a fairway selection from the Bellevue Country Club and Belturf.

America (Pickseed) originated as a single, highly apomictic plant. It was selected from the open pollinated progeny of a highly sexual hybrid. This hybrid was obtained from a progeny of the cross 'Bellevue' x 'Belturf'. America is a leafy, low-growing, turf-type bluegrass capable of producing an attractive, compact, fine-textured turf of high density and dark color. America has shown good resistance to leaf spot and leaf rust. It has shown less damage from stripe rust than many Kentucky bluegrass varieties.

Arboretum (Mangelsdorf) was selected at the Missouri Botanical Garden from old pastures and lawns in Missouri and neighboring states. It is an erect-growing variety highly susceptible to the Helminthosporium leaf spot and crown rot disease. It is useful for low maintenance turf.

Banff (Pickseed) was selected from a closely-mowed turf in Canada. This moderately low-growing, turf-type variety has medium texture and a bright, medium dark green color. Banff has excellent early spring color. It has good resistance to leaf spot and most rusts and above average resistance to dollar spot and stripe smut.

Baron (Lofts) was developed in Holland. It has rather broad leaves, a moderately low-growing, turf-type growth habit and a medium dark green color. Baron has shown moderately good resistance to leaf spot and has been widely accepted as a good bluegrass variety in many areas throughout the world. The variety has shown only moderate resistance to leaf rust, stem rust, dollar spot and powdery mildew under New Jersey conditions. Baron is moderately slow to become green in the spring. It has a large seed and rather good seedling vigor. Baron produces high seed yields.

Birka (Burlingham) was developed in Sweden. This variety has a medium fine texture, a moderately low turf-type growth habit and a moderately dark green color. Birka has shown good resistance to leaf spot, stripe smut and powdery mildew in New Jersey tests. It is moderately slow to green-up in the spring. The variety is susceptible to stem rust.

Bonnieblue (Burlingham) is a hybrid between the selection from the Bellevue Country Club and Pennstar. This moderately low-growing, turf-type variety has good resistance to leaf spot, stripe smut and leaf and rusts. It has a bright, rather dark green color and becomes green early in the spring.

Bristol is a hybrid between a fairway selection from the Bellevue Country Club near Syracuse, NY, and Anheuser Dwarf. This variety has a rich, dark green color, wide leaves and rather decumbent growth habit with a moderately slow rate of vertical growth. Bristol has good resistance to leaf spot and red thread, and moderately good resistance to strip smut, dollar spot and most races of powdery mildew.

Challenger is a moderately low-growing, leafy, turf-type variety with medium-fine leaves, medium high density, and a very attractive, bright, dark green color. It has excellent early spring color and the ability to stay green into late fall. Challenger has shown good resistance to Helminthosporium leaf spot and melting-out, leaf rust, stem rust, stripe smut, and dollar spot. Challenger is a hybrid between NJE P-123, a selection from Lafayette Park in Washington, D. C., and PSU K106, a selection found in northern Kentucky.

Cheri (Jacklin) was developed in Sweden. This variety has medium-broad leaves, a moderately low, turf-type growth habit and a medium dark green color. Cheri has shown moderately good resistance to Helminthosporium leaf spot and crown rot disease. It has shown only moderate resistance to leaf rust, stem rust, dollar spot and powdery mildew under New Jersey conditions. Cheri is moderately slow to greenup in the spring. Cheri has large seed and rather good seedling vigor.

Columbia (Turf-Seed) was selected from an old, non-irrigated, moderately low-maintenance turf near Frederick, MD. This moderately low-growing, turf-type variety has medium texture, good density, and a bright, medium dark green color. Columbia has an exceptionally attractive early spring color, the ability to stay green into late fall, and the capability of maintaining good winter color in protected locations. Columbia has shown good or moderately good resistance to leaf spot, leaf rust, stem rust, dollar spot, stripe smut and Fusarium blight. Turf produced may have a high proportion of stemmy reproductive tillers in late spring and early summer.

Common Kentucky bluegrass, South Dakota Certified, is a source of Kentucky bluegrass harvested from natu-

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development of roots, rhizomes and tillers, and causes long thin succulent leaves. Such turf is predisposed to diseases, intolerant of wear and less able to recover from injury. Kentucky bluegrass sod laid in intense shade roots slowly and usually fails in 1 to 3 years with the intense shade and wetness of climates such as New Jersey (or the Northeast).

Where shade occurs, Kentucky bluegrass seed content of a mixture should be reduced, but not omitted. This will give a blending of Kentucky bluegrass between the sun and light shade areas.

There is some variation in the shade tolerance of Kentucky bluegrass varieties. Merion, which has been one of the better varieties for general use, is highly susceptible to powdery mildew, a disease which is very damaging to susceptible varieties growing in shade, but of little consequence in full sunlight.

Selection for mildew resistance as been of primary importance in breeding shade tolerant bluegrass varieties. Warren's A-34, Eclipse, Bristol, Benverde, Touchdown, Nugget, Ram 1, Birka and Glade are bluegrass varieties with moderate-to-good mildew resistance. A number of promising experimentals also appear to have excellent mildew resistance. However, it must be pointed out that different pathogenic races of powdery mildew develop naturally which would cause some of these selections to become infected.

Shade tolerant Kentucky bluegrasses should also have good resistance to leaf spot and other diseases. Also, they must have the ability to photosynthesize enough food to give tillering, generous rooting, rhizome development and carbohydrate storage.

The ability of some of the fine fescues to tolerate tree root competition and the acid infertile soil conditions frequently associated with shaded locations contributes to their success as a shade tolerant component of a turfgrass mixture.

Disease resistance

The present varieties of Kentucky bluegrass show substantial differences in resistance to common turf diseases. Use of disease resis-

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ralized or native stands. However, some studies indicated natural stands of bluegrass in South Dakota do not contain as much genetic diversity as found in the famous bluegrass region of Kentucky. Kenblue and Park have visually outperformed South Dakota Certified Kentucky bluegrass in New Jersey tests. Studies by Dr. Glen Wood in Vermont showed that bluegrass from the Kentucky areas produced turf more resistant to weed invasion than bluegrass obtained from South Dakota.

Delta was selected in Canada. It is similar in growth habit and appearance to common Kentucky bluegrass and is also highly susceptible to the Helminthosporium leaf spot and crown rot disease. In earlier years Delta generally performed as well as common Kentucky bluegrass in turf tests at Rutgers. However, during he past few seasons the performance of Delta has been poor.

Eclipse (Jacklin) is a highly apomictic hybrid selected from the progeny of the cross 64-765-4 x Anhesuser Dwarf. The female parent, 64-765-4, was selected from the progeny of the cross SP-1 x Belturf. Eclipse is a low-growing, leafy, turf-type variety capable of producing an attractive, dark green turf of good density, good vigor and medium texture. Eclipse has demonstrated good or moderately good resistance to leaf spot, leaf rust, stem rust, powdery mildew, stripe smut, red thread, and dollar spot. It has performed well in shade trials.

Enmundi (International Seeds) is a leafy, attractive, moderately low growing variety developed in Holland. The variety has shown good resistance to leaf spot, stripe smut and Fusarium blight in New Jersey tests. Low seed yields are limiting the use of Enmundi.

Fylking (Jacklin) was developed in Sweden. This turf-type variety has good resistance to the Helminthosporium leaf spot and melting out disease. Fylking is more resistant to stripe smut, stem rust, leaf rust and powdery mildew than Merion. It is occasionally damaged by dollar spot and Fusarium blight. Fylking produces an attractive, dense, moderately low-growing turf of a rather fine texture. It maintains this leafy appearance during seed head setting time in May and June when many other bluegrasses become quite stemmy. An attractive, rich dark, green color is developed in early spring which is maintained into late fall and under moderately adverse. Fylking is moderately tolerant of close mowing. However, cutting the grass at a height of 1-1/4 inches will favor vigorous growth and help prevent weed invasion. The variety has rather fine leaves which tend to lean at higher cutting heights, thus a neater appearance is attained with moderately close mowing.

Geronimo (Jacklin) was developed by Mommersteeg International of Vlijmen, Holland. It is a moderately dark green, turf-type variety, with medium wide leaves, and medium density. It has moderately good disease resistance to the Helminthosporium leaf spot and crown rot disease.

Glade (Jacklin) is a moderately fine-textured, dark green selection obtained from an old lawn in Albany, New York. It has shown excellent resistance to stripe smut, many races of powdery mildew, and leaf and stem rust. It has moderate resistance to leaf spot. Glade is an aggressive, turf-type bluegrass with a relatively slow rate of vertical growth. This variety has shown good seedling vigor. It has performed well in blends and mixtures with other Kentucky bluegrass, ryegrass and fine fescue varieties. It has shown some tolerance of moderate shade. Glade is moderately slow in spring green up.

Georgetown (Lofts) was selected from an old turf in western Oregon. It is a moderately low-growing, turf-type variety with medium texture and a

continued on page 54

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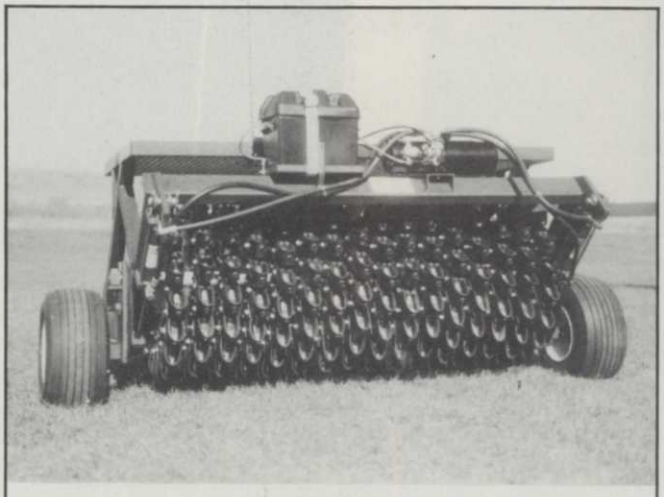

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tant varieties along with good management practices is the safest and most economical means of controlling many important turfgrass disease problems.

Resistance to disease is a prime consideration in selecting any bluegrass variety.

Melting out disease The most damaging disease of Kentucky bluegrass in New Jersey is a leaf spot and crown rot caused by the fungus, *Helminthosporium vagans*, commonly called "melting out". This disease appears on leaf blades and sheaths as circular to elongate, purplish to brown spots with straw-colored centers. Some lesions extend the entire width of the leaf, especially on the finer-bladed varieties, causing the portion the leaf blade above the affected area to wither and die.

During severe attacks, especially in late spring and early summer, the fungus causes severe leaf die-back and extensive crown rotting which leads to a melting-out condition. The weak plants and thin turf cover allow invasion by crabgrass and other unwanted weeds before the bluegrass recovers.

Under New Jersey conditions, *Helminthosporium vagans* produces abundant spores during the cool, cloudy, wet season from October through April. Moderate disease buildup may occur in the fall, persist through the winter, and subsequently intensify into severe damage in May and early June. Disease activity and spore production decrease from May through September. If the turf has not been damaged too severely it will recover significantly at this time, provided growing conditions are favorable.

The severity of the Helminthosporium leaf spot and crown rot is greatly influenced by various management practices. Disease injury is more severe with close mowing than high mowing. The shorter cut removes more photosynthetic surface thus limiting carbohydrate development. This weakens the turf, making it more susceptible to damage and less capable of recovery.

Plants receiving low to moderate levels of nitrogen fertilizer often show greater numbers of leaf spot lesions when examined in March or April. However, during late May and early June when the melting-out or crown rot phase of the disease is most severe, turf receiving high rates of nitrogen fertilizer suffers the greatest damage.

Low light intensity due to either shade or cloudy weather also lowers carbohydrate reserves and increases disease damage.

The best methods of controlling this disease are: the use of resistant varieties such as Merion, Eclipse, Bristol and Touchdown, higher cutting heights, and avoiding excessive nitrogen fertilization during the spring season. Varieties such as Park, Delta, Arboretum, S-21 and Kenblue perform little, if any, better than Common Kentucky bluegrass under New Jesey conditions due to their high susceptibility to *Helminthosporium vagans*.

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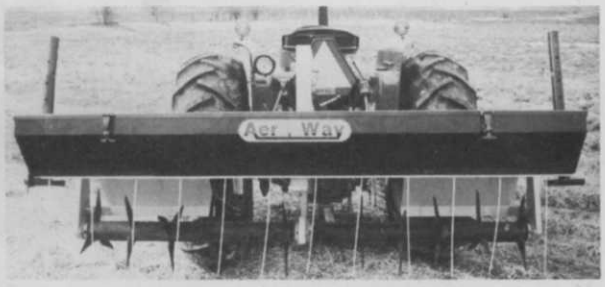

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Stripe smut Stripe smut caused by *Ustilago striiformis* is a widespread disease of Kentucky bluegrass that has caused serious damage to many turf areas. It appears to be most serious in the Middle Atlantic states but can cause damage throughout the United States. Apparently, it is not a serious problem in Europe. Stripe smut has been observed for many years and can be found in many mature bluegrass stands.

The increased seriousness of stripe smut has probably resulted from the use of susceptible varieties such as Merion, Newport, and Windsor.

Spores present in the soil or carried on the seed germinate and systemically infect tillers and young seedlings. Long, narrow, gray to black stripes develop on the leaves. The gray stripes are unruptured sori. The black streaks result when the smut sori rupture and liberate mature spores. Following rupture of the sori, infected leaves curl from the tip downward and become shredded. Such tillers then die and disappear during periods of winter and summer stress. The result is a progressive weakening and deterioration of the turf in highly susceptible varieties.

Temporary periods of partial recovery may occur. Most new stands of the susceptible varieties, if infected, do not deteriorate seriously until they are three to four years old which suggests the disease organism infects the plants slowly. Some turfs escape damage for longer periods.

Turf infected with stripe smut becomes much more susceptible to leaf spot and other diseases. It is also less likely to recover after periods of environmental stress. Resistant varieties offer the most practical means of control.

Some of the systemic fungicides are useful for control of stripe smut in turf.

Fusarium blight The Fusarium blight disease is causing serious damage to the more lush bluegrass turf in warmer regions. Fusarium blight is generally most severe during periods of high atmospheric humidity with daytime air temperatures of 80° to 95° F and night temperatures above 70° F. Temporary drought stress, high nitrogen levels and heavy thatch appear to contribute to the severity of this disease.

Control with fungicides such as benomyl requires proper timing and is expensive. More information is needed on varietal resistance to this disease(s) and on the stability of such resistance.

Planting a new production field *in rows. A band of activated charcoal protects the pure seed from herbicides used to eliminate weeds and old grass plants in the field.*

Observations at New Brunswick during the summers of 1972 through 1976 showed that varieties differed substantially in susceptibility to Fusarium blight. Under conditions of high nitrogen fertility and 3/4-inch mowing, the common types of Kentucky bluegrass including Park, Kenblue, Arboretum and South Dakota Certified showed extensive damage from Fusarium blight disease. Merion showed moderate damage. Fylking, Nugget, Geronimo, Delft, Modena and Enita had more damage than Merion. Windsor, Columbia, Enmundi, Parade, Adelphi, Rugby, Sydsport, Majestic, Vantage and Glade showed fair to good resistance in these tests.

Developing the required Fusarium blight resistance in Kentucky bluegrass will require intensive research.

Rusts (*Puccinia and Uromyces spp.*) A number of genera, species and races of rust infect Kentucky bluegrass. A variety resistant to one species or race of rust may be highly susceptible to another.

Stem rust (*Puccinia graminis*) causes considerable discoloration of susceptible varieties in many parts of the United States.

The disease is normally serious with poor vegetative growth under conditions such as low fertility and moisture stress. An improvement in growing conditions usually brings effective control as new leaf blades are removed by mowing before infection develops.

Merion and Touchdown are susceptible to stem rust, whereas Plush, Eclipse, Majestic, Adelphi, Bristol and Bonnieblue show moderate resistance to present races.

Leaf rust (*Puccinia poae-nemoralis*) is common on Kentucky bluegrass but is normally of concern on only the most susceptible varities such as Vantage.

Dollar spot Dollar spot is a fungus disease caused by *Sclerotinia homoeocarpa*. While it is severe on many other turfgrasses, this disease is increasing in importance because of the widespread use of irrigation and susceptible varieties.

On Kentucky bluegrass it forms

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CHALLENGER

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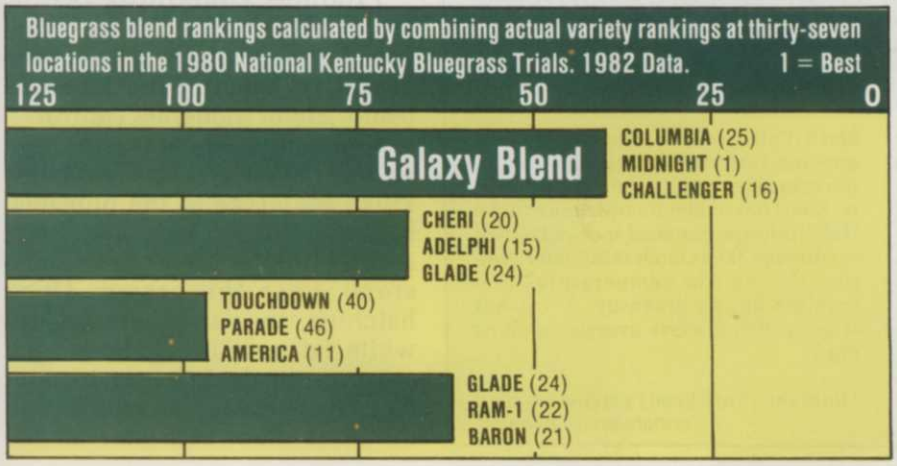
Midnight is the darkest green bluegrass available today. Midnight's low growing, compact dense turf has good heat and cold tolerance. Midnight offers good resistance to leaf spot, stem rust, stripe smut and dollar spot. Midnight adds deep, dark green color to Galaxy . . . or any turf.

Challenger has a bright dark green color and is low growing with medium fine leaves and medium high density. Challenger has good tolerance to stripe rust, and resistance to Helminthosporium leaf spot, leaf and stem rust, stripe smut, dollar spot and Fusarium blight. Challenger is fast emerging for quicker establishment.



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bright, medium dark green color. Georgetown has excellent early spring color. It is similar in appearance and performance to Parade, Haga, Banff, Rugby, Trenton, and Columbia in turf trials at Rutgers. Georgetown has good resistance to leafspot and most rusts and above average resistance to dollar spot and stripe smut.

Haga (Burlingham, Jacklin) was developed at the Weibullsholm Plant Breeding Institute in Landskrona, Sweden. Its experimental designation was WW AG 463. Haga is a moderately dark green, turf-type Kentucky bluegrass with medium high density, medium texture, and moderate aggressiveness. It has excellent cool temperature color retention and an exceptionally attractive early spring color. Late spring and early summer turf quality can be adversely affected by a stemmy appearance resulting from an abundance of reproductive tillers. Haga has good resistance to leaf spot, most leaf and stem rusts, and above average resistance to dollar spot and stripe smut.

Kenblue represents an attempt to reconstitute the type of common Kentucky bluegrass formerly harvested from naturally occurring stands of the famous bluegrass region of Kentucky. Kenblue represents a blend of seed harvested from selected seed fields of 8 to 15 years standing, situated on 12 farms located in seven central Kentucky counties. After blending, part of the seed was used to establish a breeders seed block at the University farm in Kentucky. The remainder was distributed to producers of certified seed. The first certified seed was harvested in 1967. In recent years, seed growers in Washington and Oregon have selected varieties with high seed production potential. As a result, some seed currently being sold as common Kentucky bluegrass is actually seed of one or more of these high seed producing varieties. Such seed lacks the genetic diversity of seed harvested from naturalized stands. In some situations, especially in short term tests, these varieties may perform better than common bluegrass. However, knowing the true variety has many advantages. Purchase of seed of Certified Kenblue Kentucky bluegrass will assure a consumer that he is getting bluegrass of known origin and wide genetic diversity.

Majestic (Burlingham) is a moderately low-growing, turf-type bluegrass with a rich dark green color and rather prostrate leaf blades. It has shown good resistance to leaf spot and leaf rust and moderate resistance to dollar spot, stem rust, and stripe smut. Majestic has excellent color especially during the cool seasons of spring and fall. It greens up early in the spring.

Merion originated from a single plant selection made by Joseph Valentine of the Merion Golf Club, Ardmore, Pennsylvania in 1936. Until the early 1970's, Merion was the only commercially available variety with good resistance to the Helminthosporium leaf spot and crown rot disease. This quality made Merion the Cadillac of bluegrass varieties for well-maintained turf areas. Under conditions of high fertility and moderately close mowing, common Kentucky bluegrass and other susceptible varieties often show over 80% browning and thinning from melting-out under conditions where Merion normally shows little damage.

Compared with common Kentucky bluegrass, Merion has wider leaves, lower growth, darker green color when properly fertilized, higher resistance to *Helminthosporium vagans* and greater tolerance for close mowing. When properly managed, Merion can produce an attractive, dense, vigorous turf, highly resistant to weed invasion and capable of withstanding moderate wear.

Certain weaknesses of Merion are also recognized. Stripe smut, which frequently damages older stands, is the most serious problem. Merion is also highly susceptible to powdery mildew and should not be used in heavily shaded areas where it usually fails within several years. Stem rust susceptibility can be a problem, especially under conditions unfavorable to good growth. Merion may also be damaged by Fusarium blight. The latter disease is associated with turf weakened by high temperatures, excessive nitrogen, thatch accumulation, close mowing and with prolonged drought or improper watering. Many other bluegrass varieties can be damaged extensively under similar conditions. Susceptibility to dollar spot under low fertility conditions is becoming an increasing problem.

Merion is normally a vigorous, aggressive grass that will generally crowd out most other bluegrass varieties mixed with it under conditions of adequate fertility, frequent mowing and vigorous growth. Healthy, well-maintained Merion turf is seldom invaded by crabgrass or other weeds, but when weakened by stripe smut it is not aggressive.

Merion frequently requires and normally tolerates more fertilizer than common Kentucky bluegrass. However, excessive fertility is to be avoided, especially in older stands.

Merit (Full Circle) is a moderately low-growing, turf-type variety with a medium coarse texture, and medium density. Merit has moderate resistance to the Helminthosporium leaf spot and crown rot disease. It has moderate color retention during low temperatures and medium spring green-up. Merit has large seed and above average seedling vigor.

Midnight (Turf-Seed) originated as a

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small circular spots (two to five inches in diameter) which may merge to form large, irregular areas. The spots become a light straw color and dead grass occupies the center. Fine, white, cobwebby mold growth may be seen in these spots on mornings when a heavy dew is present and the fungus is active. Lesions on individual leaves appear as bleached areas extending the width of the leaf with constricted margins and a chocolate-brown border.

Moderate temperatures (68-86° F) and thick thatch are favorable for dollar spot buildup. Turf deficient in nitrogen tends to show more damage from dollar spot than turf which is adequately fertilized.

Different races of dollar spot respond differently to fungicide control and may attack varieties in a differential manner.

Insects

White grubs frequently cause extensive and serious damage to Kentucky bluegrass turfs as well as most other turfgrasses. These grubs are the larvae of several species of beetles and chafers including the Japanese beetle, the May and June beetles, the European chafer, and the northern masked chafer. Fully grown larvae are 1 to 2-cm long, white to grayish, with brownish heads and six distinct legs.

Severe infestations feeding on grass roots can cause serious thinning and death of the sod especially under drought stress. Birds, moles, and skunks actively feed on grubs tearing up the sod as they search for them.

Products containing resting spores of the milky disease organism, *Bacillus popilliae*, have been useful in keeping the Japanese beetle under moderate control.

Kentucky bluegrass is often severely damaged or completely killed by larvae of the bluegrass billbug. During May and June, adult billbugs lay eggs in grass stems near the crown. Upon hatching, the larvae are legless, white, fat, up to 1 cm in length and are present during July to mid-August. These larvae feed within the grass stem and later on the

MERIT

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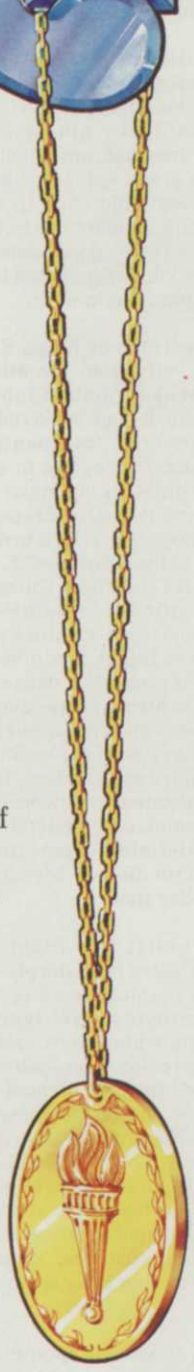

Consistently rated a winner for turf quality, color and sod strength, it has also been cited for its resistance to both leaf and dollar spot.

A variety with outstanding seedling vigor, it has won high ratings in shade trials and has excellent spring color.

The record proves Merit is a performer. It was ranked Number 1 for turf quality in a three-year University of California trial in competition with 43 varieties, topping Adelphi, Baron, Columbia, Cheri, Victa, Rugby, Sydsport, Ram I, and Parade.

It has also outperformed Baron, Nugget, Fylking, Adelphi, Glade, and Bonnieblue in various trials such as 1972 NE-57, in New York, in an eight-year Purdue study, a three-year Ohio trial and in a four-year Missouri test.

Note: Merit is marketed in Canada as "Regent Kentucky Bluegrass."

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single, highly apomictic aberrant plant selected from the open-pollinated progeny of F64-603, a selection made from an old lawn located near the Natural History Museum in Washington, D. C. Midnight is a persistent, low-growing, turf-type variety with the ability to produce a compact, dense turf with medium fine texture, a slow leaf extension rate, and a very dark green color. It has good heat and cold tolerance, fair shade adaptation, a slow spring greenup rate, and moderate low temperature color retention in late fall. Midnight has shown good resistance to leafspot, stem rust, strip smut, and dollar spot.

Monopoly (Pioneer Hi-Bred) was developed by Mommersteeg International of Vlijmen, Holland. Monopoly is a vigorous turf-type Kentucky bluegrass with medium texture, medium density, and a medium green color. It has shown excellent wear tolerance in a recent medium maintenance turf trial. Monopoly has moderately good resistance to leaf spot and dollar spot, and is promoted for its rapid germination.

Mystic (Lofts) was selected by Ralph E. Engel and Al Caravella from the 8th fairway of the Echo Lake Country Club, Westfield, NJ, where it had survived repeated sodium aresenite treatments used to destroy annual bluegrass in a fairway renovation program. An apparently identical plant was also found growing as a very large, attractive turf on the 14th fairway of the Seawane C.C. of Hewlett Harbor, NY, by Frank Curra and A.R. Mazur. Mystic is a low-growing, fine-leafed, turf-type Kentucky bluegrass. It displays a bright, medium-green color, and can produce a dense, attractive turf that is highly aggressive and which competes well with annual bluegrass. This makes it well suited for use on golf course fairways and tees. It has shown good resistance to powdery mildew and stripe smut, and moderate resistance to the Helminthosporium leaf spot and crown rot disease. Mystic is susceptible to dollar spot.

Nassau (Jacklin, Lofts) is a highly apomictic hybrid selected from the progeny of NJE P-59 x Baron. Nassau is a moderately low-growing, turf-type variety with medium wide leaves, and a medium dark green color. It is capable of producing an attractive turf of medium density. It can become very stemmy during late spring. Nassau has shown good resistance to the Helminthosporium leaf spot and crown rot disease. It has also shown above average resistance to dollar spot, red thread, pink snow mold, leaf rust, and stem rust. Nassau has attractive early spring color.

Newport originated as a single apomictic plant selected from coastal bluffs near Newport, OR. It is a moderately low-growing variety with rather dark green leaves and fairly good establishment and turf-forming characteristics during the first two or three years. Newport has demonstrated good resistance to most current races of stem rust and powdery mildew, but is susceptible to leaf spot and stripe smut. Turf stands of Newport become very stemmy at seedhead setting time in June.

Older plantings of Newport have been heavily invaded by weeds and have freqently shown poor recovery fom drought. Newport is often a short-lived type under New Jersey conditions, performing better than common Kentucky bluegrass during the first two or three years of a test; but it does poorly or dies as it ages. Its best use appears to be in blends with other more persistent bluegrass varieties.

Nugget (Pickseed) is a very distinctive variety. Nugget was found growing in Hope, Alaska. This variety produces a very dense, compact, rather low-growing turf which can be extremely attractive, especially in mid- to late-spring. Nugget has good to excellent resistance to leaf spot, most races of powdery mildew and leaf rust. Unfortunately, it appears to be susceptible to stem rust, dollar spot, Fusarium blight and aphids. Ths variety has good tolerance of close mowing and moderate shade when free of disease and insect damage. Nugget is very slow to start growing in the spring and has very poor early spring color in temperate climates. Nugget has frequently looked promising in preliminary turf trials throughout the northern part of the United States and Canada. Its performance in more southern areas has been very erratic.

Parade was developed in Holland. This moderately low growing, turf-type variety has medium texture and a pleasing moderately dark green color. Parade has good resistance to leaf spot, leaf rust and stem rust. It has above average resistance to dollar spot and stripe smut. Parade has excellent early spring color. Early summer turf quality is often adversely affected by an abundance of reproductive tillers.

Park resulted from an extensive selection and testing program initiated in Minnesota in 1937. A large number of plants were collected from old pastures and wasteland areas and tested for breeding behavior and agronomic performance, The 15 best apomictic strains were blended to produce Park, which was released in 1957. The variety has excellent seedling vigor and has shown moderate resistance to stripe smut, leaf rust and stem rust. Some of the component strains have good resistance to powdery mildew. Park is similar in appearance and growth habit to common Kentucky bluegrass and is susceptible to Helminthosporium leaf spot. Under New Jersey conditions, Park has often shown some advantages over common Kentucky bluegrass.

Plush (FFR Cooperative) originated as a single, highly apomictic plant selected from the lawn of Warinaco Park in Union County, NJ. Plush is an aggressive, persistent, moderately low growing, leafy, turf-type Kentucky bluegrass with medium texture, good vigor, medium high density, and a medium green color. It has shown good resistance to stripe smut and dollar spot and moderately good resistance to leaf spot and stem rust. Plush has shown good heat and drought tolerance.

Ram I (Jacklin, Lofts) was discovered growing on a putting green of the Webhannet Golf Club in Kennebunk Beach, Maine. Ram I is a moderately low-growing, leafy, turf-type cultivar with a medium texture and a rich, dark green color. Ram I has shown good tolerance of moderately close mowing and good early spring. color. It has moderate resistance to leaf spot and stem rust, good resistance to stripe smut and most races of powdery mildew. It has moderate susceptibility to leaf rust and dollar spot.

Rugby (SPIC) is a moderately low-growing, turf-type variety with medium texture, good density, and a bright, medium dark green color. Rugby has a very attractive early spring color, the ability to stay green into late fall, and can maintain good winter color in protected locations. Rugby has shown good, or moderately good resistance to leaf spot, leaf rust, stem rust, dollar spot, stripe smut and Fusarium blight. Turf produced by Rugby is generally very stemmy during its reproductive period in late spring and early summer.

Sydsport (Burlingham) was developed in Sweden where it is reported to have good tolerance of the wear and abuse received on athletic fields. It has medium wide leaves and can produce a rather tight, dense sod of a medium light green color. Sydsport appears to have moderately good resistance to leaf spot and stripe smut but high susceptibility to dollar spot has been observed in some tests.

Touchdown (Pickseed) is a fairway selection from the National Golf Links of America located on Long Island. It has excellent resistance to leaf spot, stripe smut, leaf rust and most races of powdery mildew but is moderately susceptible to stem rust and dollar spot. Touchdown is a very aggressive turf-type variety with medium texture and a moderately dark green color. Like Warren's A-34 and Mystic, Touchdown has an excellent record of being able to compete well against annual bluegrass in closely mowed tests at Rutgers. These very aggressive varieties will normally dominate in blends and usually produce more thatch. Touchdown also shows promise of good performance in moderate shade.

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crown, bases of adjacent stems, and on roots and rhizomes.

Sod damaged by larvae is easily pulled from the soil with stems breaking off at the crown. The presence of fine, white, sawdust-like material at the base of each severed tiller is further evidence of billbug feeding. Billbug damage is most severe if turf is under moderate drought stress.

Studies at Nebraska and New Jersey show significant differences in cultivar resistance. Generally, the narrow-leafed, early maturing common types show less injury. However, some improved turf-type cultivars also show promising resistance.

Sod webworms are frequently destructive in lawns. In the warmer months, adult, grayish-white to beige moths frequently fly over lawns and pastures in late evening and drop eggs into the turf. Larvae live in silk-lined tunnels in the thatch during the day and feed on grass blades during the night.

Cutworms are the larvae of a number of species of night-flying moths. Cutworm larvae feed at night on grass leaves which they chew off close to the soil surface. Birds, particularly starlings, frequently visit turf infested with sod webworm and cutworm larvae and create numerous small circular holes in the sod.

Chinchbugs prefer sunny, hot, dry conditions and often cause serious damage, especialy on south and west facing slopes. Plant injury occurs as a result of the insect sucking fluids from the plant. At the same time they inject salivary fluids. This disrupts the water-conducting tissues causing plants to wilt and turn yellow or brown. A fungus, *Beauveria* sp., is normally effective in reducing populations of chinch bugs when moisture conditions are adequate for fungal growth.

The adult frit fly is a very small, shiny, black fly. Larvae (maggots) hatch from eggs layed on leaves and in leaf sheaths. They immediately tunnel into and feed within grass stems. Initially the bluegrass has a yellow appearance as younger leaves emerging from infested tillers are damaged. As feeding progresses

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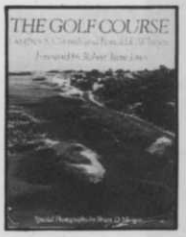

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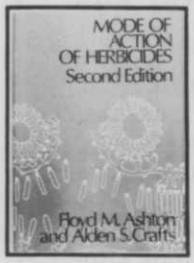

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WTT 64

National bluegrass test shows regional differences

Performance of Kentucky bluegrass varieties varies by location. To point out regional differences, the National Turfgrass Evaluation Program was developed in 1980. Jack Murray, agronomist, USDA Agricultural Research Service, Beltsville, MD, was selected national coordinator.

Thirty-seven test gardens were set up in 22 states and two provinces of Canada for the trial. Data for 1982 and 1983 has been collected.

The tests judge the varieties by location, and by a number of other factors; including disease resistance, seasonal condition, leaf texture, density, drought tolerance, sod strength, and insect resistance.

Murray cautions that the data is just for the second year of a multi-year evaluation and that seed companies presented seed from just one lot for the tests. Variation by year and between seed lots should be considered. Although varieties were listed in order from best to worst, the difference between some may be considered insignificant.

When data from all locations and for all months was combined and averaged, those with the best quality *overall* were Eclipse, Midnight, Bristol, Adelphi, America, Banff, Baron, Enmundi, Majestic, Challenger, Ram-1, Sydsport, Bonnieblue, Cheri, Columbia, Glade, Rugby, and Victa. A number of experimental varieties were included among the top national performers.

The leaders in the home state, *Kentucky*, were America, Eclipse, Banff, A-20, Nassau, Merion, Mystic, and Monopoly.

Many bluegrasses performed well in *Delaware*. The best were Midnight, Bristol, Enmundi, Mystic, Kimono, Bonnieblue, Challenger, Majestic, and America. *Maryland* was led by Merit, Victa, Baron, and Kimono. *Virginia's* four locations gave the edge to Eclipse, America, Wabash, Columbia, Cheri, Enmundi, Adelphi, Bristol and Midnight.

Georgia's best bluegrasses were Columbia, Birka, Enoble, Monopoly, Sydsport, Adelphi, Majestic, Midnight, and Baron. *North Carolina* leaders were Baron, Enmundi, Cheri, Glade, and Parade.

Iowa's favorites were Midnight, Majestic, Challenger, Ram-1, Glade, Bonnieblue, Victa, Merit, Nassau, Nuggett, and Bristol. *Nebraska*, with four test areas, favored Enoble, Majestic, Wabash, and Geronimo.

Eclipse, Adelphi, Sydsport, Bonnieblue, Touchdown, A-20, and Enmundi performed best in *Illinois*. Baron, Challenger, Glade, Columbia, Touchdown, Adelphi, Enmundi, Ram-1, Cheri, and Victa showed them in *Missouri*. Midnight took *Kansas* by storm with closest rivals Bristol, Eclipse, Challenger, Bonnieblue, Victa, America, and Majestic.

New Jersey results were better than New York's. The leaders in *New Jersey* were Eclipse, Challenger, Midnight, Bonnieblue, Kimono, Glade and Majestic. *New York's* two locations favored Eclipse, Monopoly, Midnight, Sydsport, Cheri, and Wabash.

In the Northwest, where most of the seed is grown, *Oregon* winners were Eclipse, Sydsport, Columbia, Midnight, Majestic, Challenger, and A-20. *Washington* leaders were Ram-1, Rugby, Banff, Shasta, and Fylking.

For the complete report, write USDA Science and Education Administration, Plant Genetics and Germplasm Institute, Beltsville, MD 20705.□

Written by Bruce F. Shank, executive editor

these infected tillers die. Careful examination of the tiller base will reveal one or more active, small white maggots with two characteristic mouth hooks visible with a good hand lens.

The greenbug aphid has recently become a serious pest of Kentucky bluegrass in a number of locations throughout the midwestern United States. The piercing mouthparts of the greenbug are inserted into leaf blades to suck out plant fluids. This probing and the injection of salivary fluids causes leaf tissues to turn yellow to light orange, then even darker orange and finally to brown as the plant may die under very heavy infestations . Scientists at Beltsville, MD, are developing Kentucky bluegrasses with good resistance to the greenbug aphid.

Growth habit and turf-forming properties

The growth habit of Kentucky bluegrass is influenced greatly by day length, light intensity and temperature.

During short days, Kentucky bluegrass assumes a more decumbent(spreading) growth habit, has a slower rate of leaf elongation, and tillering is more abundant. During long days, growth is more erect and leaf elongation is more rapid. Reproductive development also occurs during the long days of late spring.

High light intensity increases photosynthesis and promotes the development of thick, sturdy leaves and a deep green color. Low light intensity produces weak, thin, etiolated(pale) plants with a rapid rate of leaf elongation.

Common Kentucky bluegrass and varieties such as Park, Delta and Kenblue have a rather erect growth habit with a rapid rate of leaf elongation. Such varieties do not tolerate high nitrogen fertility and close mowing, especialy during the spring and summer seasons.

During the long days of spring and summer these varieties make noticeably taller growth. This results in the removal of a higher percentage of the leaf area and makes maintenance of good turf in late spring and summer difficult. Carbohydrate food reserves are depleted and such varieties become highly susceptible to damage from the Helminthosporium leaf spot and crown rot disease.

Varieties such as Nugget, America, Eclipse and Glade appear to exhibit the short day length response of decumbent growth and slow leaf elongation through much more of the year than the common type bluegrass varieties. Additional research related to differential varietal growth response to day length should be of great value in breeding bluegrasses with better turf-forming properties and reduced mowing requirement.

Tolerance of close mowing

For golf course fairways, the turf should make an attractive, uniform carpet which is dense enough to give a good lie to the ball. It must also be able to heal divots rapidly, tolerate considerable traffic and resist the invasion of annual bluegrass.

Frequent, close mowing, adequate fertility and water are needed to produce the firm, dense turf required to support the ball above the soil surface. A dense turf has a much higher population of tillers per unit area which causes increased competition between tillers. This, plus severe defoliation by low fairway mowing and ample fertilization weakens the grass. It develops a less extensive root system and is more subject to drought damage and disease attack.

Close cutting and frequent watering encourages rooting above the soil surface and thatch buildup. This favors many disease organisms. Also, damage from disease is more apparent on an otherwise attractive, uniform closely cut turf.

Kentucky bluegrasses have some tolerance of the close mowing and other factors associated with the production of the dense, firm, aggressive turf desired on fairways. They have the best chance of success with high light intensity, cool temperatures and moderate humidity.

In less favorable climates, improved varieties and better management are needed for successful results. Many of the current Kentucky bluegrass varieties including Nugget, Warren's A-20, Touchdown, Bonnieblue, Eclipse, Birka, Fylking, Majestic, Merion, Adelphi, Glade, Sydsport, Victa, Cheri, RAM 1, and Baron have characteristics which make them more suitable for close-cut fairways than Common Kentucky bluegrass and other erect-growing leaf-spot-susceptible varieties. Unfortunately, each of these varieties has some weakness.

Proper blending of seeds of these improved varieties might help but will not solve all the potential problems associated with fairway turf. Those who use the turf-type ryegrasses as a major fairway grass will find maintaining Kentucky bluegrass in the mixture helpful. New Kentucky bluegrass selections collected from close-cut areas and those generated in hybridization programs give promise of additional improvement.

Heat tolerance

Kentucky bluegrasses with greater tolerance of summer heat and drought conditions common to the transition zone would be of great benefit.

Most of our attractive, dense, lower-growing, turf-type varieties were selected in the cool summer climate of Northern Europe and from other breeding and evaluation tests located in cool environments. Many of these varieties are often disappointing in southern trials.

An extensive program to collect and evaluate adapted germplasm from summer stress areas of the Mid-Atlantic areas should provide varieties with improved summer performance and dependability. Under conditions of moderately low nitrogen fertility and high cut, varieties that typify common types, such as Kenblue, have survived well in the transition zone.

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Circle No. 112 on Reader Inquiry Card

Troy was selected from a seed lot introduced from Turkey. It is a tall, erect-growing grass highly susceptible to leaf spot. Troy has been useful as a pasture grass in Montana region but performs very poorly as a turfgrass.

Vantage (International Seeds) was developed by O.M. Scott and Sons of Marysville, OH. Vantage is a persistent Kentucky bluegrass with deep spreading rhizomes, a medium dark green color and a medium texture. It has very good heat and drought tolerance. Vantage has performed well in higher cut, medium maintenance turfs in the Middle Atlantic region of the U.S. where it has shown good resistance to the Fusarium blight disease. However, this same variety has been seriously damaged by Fusarium blight disease in California trials. Vantage has good resistance to stripe smut and dollar spot and moderate resistance to leaf spot. It is susceptible to leaf and stem rusts.

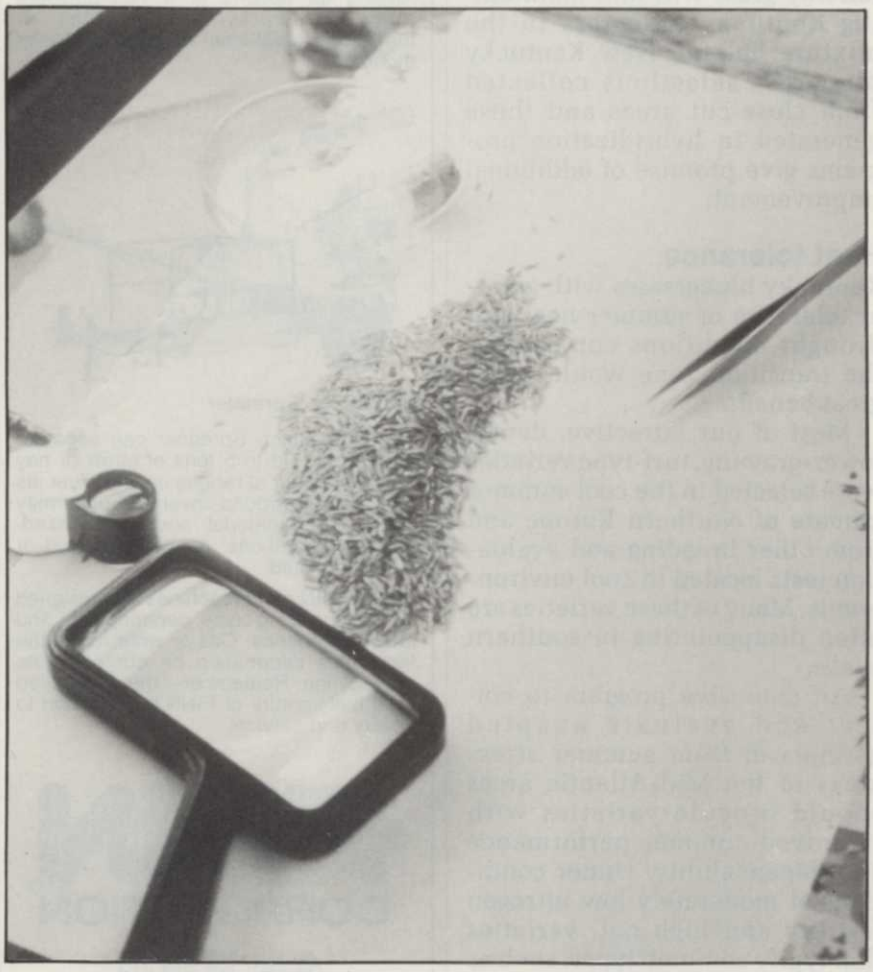
Victa (Scotts) was developed by O. M. Scotts. It has medium broad leaves, a moderately low-growing, turf-type growth habit and a medium dark green color. The variety has shown moderately good resistance to leaf spot. It has shown moderate resistance to leaf rust, stem rust, dollar spot and powdery mildew in New Jersey tests. Victa is moderately slow in spring green-up. It has large seed and rather good seedling vigor.

Wabash was developed at Purdue University. It is a is a vigorous variety with exceptionally good rhizome development and ability to recover from stress. It produces a turf of medium density, medium wide leaves, and a bright, medium green color. Wabash often shows substantial damage from the Helminthosporium leaf spot and melting-out disease, especially when mowed closely. However, it recovers well and looks very attractive by fall. It showed the best fall recovery of all bluegrasses studied in a test at North Brunswick which had received severe summer stress.

Warren's A-34 (Warren's) is a vigorous, disease resistant variety with somewhat better shade tolerance than most other Kentucky bluegrass varieties. When maintained at a 2-inch growing height, it will tolerate 65% shading. A-34 does rather well in full sun, producing a dense, medium green turf with moerately good resistance to stripe smut, powdery mildew and leaf spot. It also performed well in wear tolerance trials in Michigan.

Varietal Blends Admitted weakness of all currently available bluegrass varieties has caused many turf workers to recommend the use of varietal blends for better lawns, fairways and most other types of turf. It is hoped that the weakness of one variety will be covered up by a complementary strength of other variety. This may or may not be true depending upon a number of complex ecological factors. We need much more research data on ecology, long-term performance and regional adapation of bluegrass blends.

Research at Rutgers strongly suggests that varieties with good resistance to both stripe smut and Helminthosporium leaf spot should be included in all turfgrass blends recommended for use on intensely maintained turf areas. Also, one or more should have high tolerance of close-cut unless the turf will be mowed high. □



Seed samples are tested *in a lab after cleaning. Contents are reported on the seed label.*

Under conditions of somewhat closer mowing and higher fertility the lower-growing, wider leafed, open types having extensive deep rhizomes, such as Vantage, have performed better. Merion Kentucky bluegrass has shown above average summer performance when managed properly and when disease is not a problem.

Color

Visitors at experimental plantings of Kentucky bluegrass selections and hybrids are impressed by the great diversity of shades of green observed.

Mystic has a very attractive bright light green color. Adelphi ad Glade have bright, dark colors. Some selections like Bonnieblue, Parade, Columbia and Majestic retain excellent color into the winter and green-up early in the spring. Others like Midnight and Baron go dormant in late fall and green-up later in the spring. Still others like Nugget green-up very slowly in the spring.

Many types show a pronounced purplish cast in late fall, winter and early spring, whereas some, such as Parade, Columbia, Rugby, and Bonnieblue appear to lack this purplish pigment. **WT&T**

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Circle No. 103 on Reader Inquiry Card

Building Self-Preservation Into Turf Equipment

by Thomas M. Carter, Vice President, Engineering, Jacobsen Division of Textron Inc.

Overheating can destroy an engine. *Simple air intake systems are being improved with devices which prefilter ambient air from a high location and ducts it to the engine. The result is longer engine life.*

The evolution in turf equipment hasn't been confined to improving or expanding the tasks these machines perform, despite their growing sophistication.

Along with doing the work expected of them better and in less time, turf and grounds care people now more than ever demand a longer trouble-free life with reduced maintenance as an added bonus.

Public and private mandates haven't changed for attractive and useful parks, golf courses, recreational and other turf areas. Only the budgets have.

The turf equipment engineer's assignment has been very clear: design machines that do more, last longer and are easier to maintain.

While hydraulics and other systems and components that together mow, aerate, sweep or perform many other chores, have been constantly improved, nothing moves without power.

Evaluate power

In other words, the demands on our engines have never been greater, making it manditory for a variety of power plants to undergo a process of intense evaluation before one is selected.

Tough duty

In the same way, the turf machine user should evaluate the engine with the same care he applies to assessing overall function and key features like hydraulic versus conventional mowing.

The importance of engine evaluation can hardly be overstated when one considers the tough world of turf care. These machines are run for long periods of time under varying load conditions. Oftentimes, operators have little or no sensitivity to mechanical devices, overloading their machines and routinely subjecting them to other abuses. And, as budgets tighten, regular maintenance sometimes suffers.

On top of all that, turf machines operate in harsh environments of dust, dirt and other particulates that are often made even worse by high ambient temperatures and a surface seemingly designed to test every fastener.

Seasonality plays a role, too, with year-around turf use for some regions and six months of service for others.

There are the so-called "systems machines", such as our Turfcat II line, which with attachments like a dozer blade or snow thrower are used for clearing walks and drives in winter — or sweeping anytime of the year with a rotary broom. These versatile machines and the diverse and frequently harsh conditions under which they operate call for engines with a high degree of self-preservation designed and built into them.

Smooth power

In mid-sized turf equipment perhaps the first item for your evaluation is the number of cylinders. Two-, three- and four-cylinder engines — gas or diesel — will outwear and be smoother than single-cylinder power. Though there are exceptions to the rule, generally multi-cylinder engines are more sophisticated with features that add up to better performance and increased longevity. But, no matter how many cylinders, an engine will depend on the machine around it and system components to be designed in such a way as to help assure a long, productive life.

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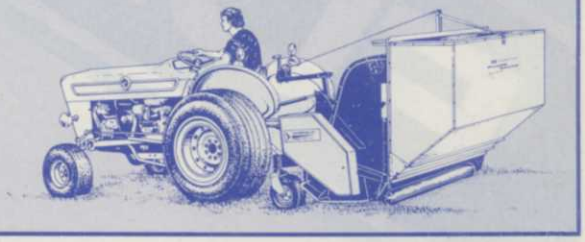

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Carburetion

Gas and diesel engines alike require a relatively specific ratio of clean air-to-fuel to function properly, so the air cleaner for each power plant should be sized to filter out damaging dust and dirt of turf care while allowing proper aspiration. One way to decrease performance and reduce engine life is to upset that ratio by not replacing the air filter at proper intervals and letting it become clogged.

To avoid clogging turf equipment engineers have gone a step further from the traditional placement of the air cleaner atop the carburetor on the engine. We take in air through a screened opening just behind the operator's seat and then duct it to the cleaner. The cleaner itself is non-traditional, too, because we use a large, industrial unit.

Cooling

Cooling the engines of turf equipment is far more involved than keeping the temperature in line on cars, trucks or even many agricultural machines. It's not enough to draw air in the conventional manner for either liquid- or air-cooled power plants. Turf machines require controlled air via special ducting, using precleaners to remove dirt that would eventually build up on radiator cores or cooling fins, thus raising engine temperatures to damaging levels.

In addition to looking for ducting and precleaners, check for the position of the air intake. It should draw from the ambient atmosphere; not from air preheated by the engine.

Lubrication

Lawn and garden tractor engine technology simply can't be used for turf machines. Usually that type of power has splash lubrication. That may be quite satisfactory for several hours of periodic work, but the duty cycle of the turf machine requires full flow lubrication to make certain all moving parts constantly receive a quantity of oil that relates to the work being performed. As power demands and rpm increase, so does the flow of oil to reciprocating and rotating parts.

But, engine oil can do more than lubricate. It also can cool, so watch for added touches like a larger remote oil filter and possibly an oil cooler. Check for a warning light on the control panel to let you know operating temperature has reached a level that, if sustained, could damage the engine. The latest machines may even have heat sensors that signal the operator.

Inside the engine

You can easily see engine peripherals — cooling, carburetion, exhaust system, and so forth. But what you can't see beyond the new paint of the engine may be even more important to performance, life span, and maintenance.

Take the valves. In addition to admitting the air-fuel mixture and exhausting combustion gasses, valves maintain compression, and thus, the power you required when you specified the machine.

To make certain power remains consistent, you'll want to look for a variety of features, such

The Professional Lawn Care Association of America 1984 Conference & Trade Show November 12-15, Tampa, Florida

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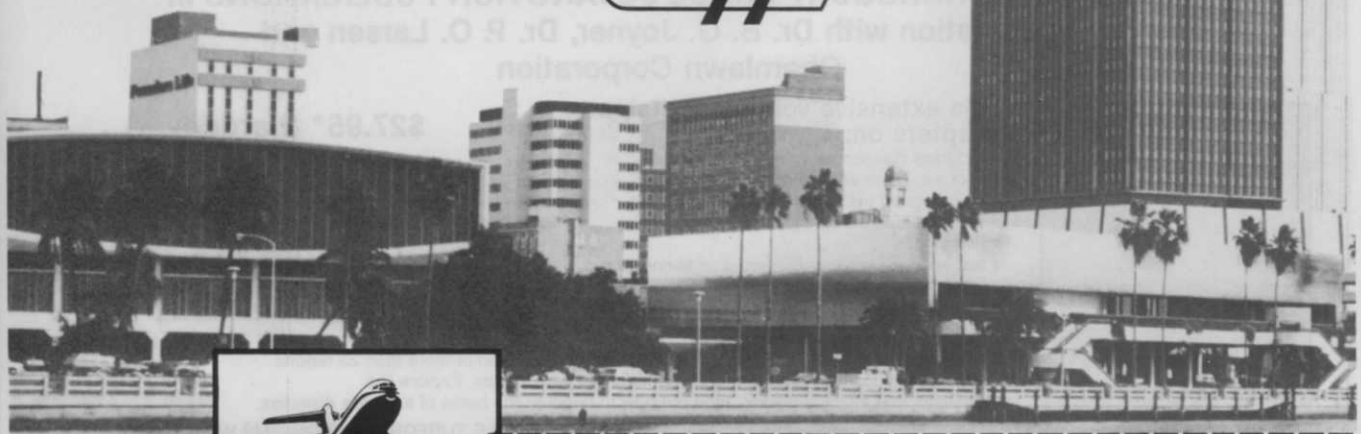

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as rotators for both intake and exhaust valves. These cause valves to turn minutely as they actuate to help assure proper seating. Valve stem wipers are another desirable feature. These nonmetallic "sleeves" prevent carbon buildup on the stems by wiping off traces of that element with every stroke. Excessive carbon on the stems can deteriorate their guides, allowing sump oil to escape into combustion chambers, reducing plug performance and increasing oil consumption.

High temperatures created by sustained operation could cause valve warpage were it not for the special high-carbon alloy steel (such as Stellite) used for the valves in some engines. Besides loss of compression, severe warpage can lead to a breakdown.

The power you count on is primarily maintained by compression rings pressure fitted on the pistons. Those engines that use high-grade steel in compression rings will deliver many thousands more hours of performance. The difference in head gaskets can spell blow-by. A top quality product such as the metal-clad Graphoil gasket resists erosion from extreme combustion pressures, gasses and sustained high operating temperatures. The small extra cost of a quality product is negligible when compared with the downtime involved in replacing a head gasket.

Combustion chambers vary, too, with the more sophisticated head design almost always worth the investment. For example, crowned head chambers create a highly turbulent swirling action to optimize the air-fuel ratio. This adds up to more power from a smaller displacement — and more economical operation.

Intake and exhaust manifold design should be considered, too.

Other features to watch for include industrial-grade bearings, heavy-duty crankshaft, and a mechanically driven fan (turf machine speeds are too slow for ram air cooling common in automotive road speeds).

Vibration and sound

How the engine is mounted will influence performance, too. Isolated mounts, those that separate and cushion the engine from the frame, greatly reduce vibration, which is as important to operator comfort as it is to component life.

An industrial-grade muffler not only makes sense from a standpoint of longer wear and less resistance to exhaust pressures, its quieter operation is less stressful for the operator and better conforms to noise restrictions.

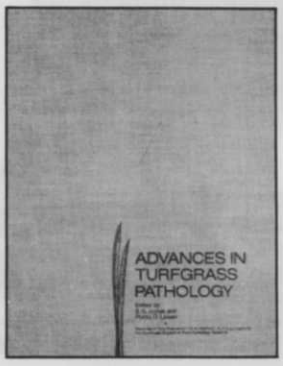
Cursory appraisals of turf equipment have no place in today's economic climate. Functionally, machines may look quite alike. Even performance specifications may be similar.

It's only when the buyer goes well beyond the obvious that the product designed for a decade or more of regular use begins to emerge. The engine should head an evaluation list, for measuring the productivity of the machine begins with its performance.

WT&T

Advances in Turfgrass Pathology

published by HARCOURT BRACE JOVANOVICH PUBLICATIONS in cooperation with Dr. B. G. Joyner, Dr. P. O. Larsen and Chemlawn Corporation



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Circle No. 142 on Reader Inquiry Card

PROBLEM SOLVERS

by **Balakrishna Rao,** Ph.D., and **Thomas P. Mog,** Ph.D.

Summer fertilizer safety

Problem: *Our lawns are dethatched, limed (50 lbs./1,000 sq. ft.) and fertilized (10-6-4, 50% fertilizer) each spring and fall. The lawns consist mainly of Kentucky bluegrass and creeping and tall fescue with very little ryegrass, and all the clippings are picked up after mowing. Our summer fertilizer is 20-4-10, 40%. If this is applied before July (mandatory) would it be too strong for summer? (New Jersey)*

Solution: Not knowing the exact amount (lbs./1,000 sq. ft.) of different fertilizers being used during different times of the year, it is difficult to respond to your question. However, if you are using these fertilizer formulations to provide no more than 1 lb. of actual nitrogen per 1,000 sq. ft. per treatment, then it should be safe enough to use in summer.

Sandburr control in Texas

Problem: *What will eliminate sandburrs in the east Texas area between Dallas and Shreveport? (Texas)*

Solution: You can use the preemergent materials like diphenamid, trifluralin or EPTC for sandburr weed control on turf and ornamentals in Texas. Although results may vary, you can expect some level of control from the use of these products.

You can expect better results using arsenical materials such as DSMA or MSMA as postemergent herbicides. These arsenical materials , however, may have phototoxic effects and produce temporary discoloration of the treated area. Treat the area when weeds are young and actively growing which would be during late spring and early fall.

Needle drop on Douglas fir

Problem: *One of my account's Douglas fir trees are turning color and dropping their needles. What's really strange is that two trees may be right next to each other; one will be healthy and the other appears to be dying. Do you know what is causing this? (New York)*

Solution: There are two possibilities; 1) a needle disease and 2) natural shedding of the older needles. So-called "evergreens", like the pines, spruces and firs, shed their foliage just as the broadleaved or deciduous trees do. Most conifers hold their needles for two or more years, after which they are shed.

Needle drop usually occurs in the fall and is a natural process which normally takes several weeks. Sometimes adverse environmental conditions trigger color change and shedding of the older needles at times other than fall. When this happens, the trees' appearance may change from normal to abnormal in a period of days. In both instances the newest needles are still on the tree.

Several different fungi can cause somewhat similar symptoms. The fungi responsible for a diseased condition that results in premature shedding of the foliage are collectively known as needlecast fungi. With needlecast, one tree may be diseased and a nearby tree of the same species can be free of symptoms. This phenomenon is often attributed to differences in genetic makeup and is called host resistance.

If all firs were showing similar patterns of injury involving only the older needles, then one would suspect natural or environmentally induced shedding of the foliage and not disease.

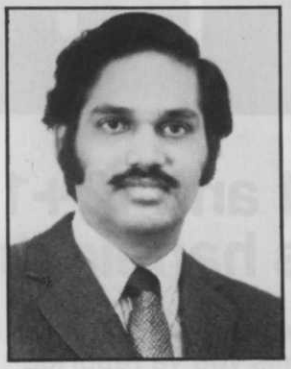
Wood ashes as fertilizer

Problem: *What kind of nutrient value is there in wood ashes from fireplaces? Some of our clients are thinking of using these around trees. I would appreciate your comments in this regard. (New York)*

Solution: Recently, there has been increased interest in the use of wood ashes produced from fireplace burning as a fertilizer source. The wood ashes from fireplaces contain about 5% k2o (potassium) and 25% Ca (Calcium). Many people use these ashes as fertilizer in their gardens. Hardwood ashes are frequently used as fertilizer for tobacco growing. From this information, I would imagine that the ashes from fireplaces could be used as fertilizer to supply the above nutrients.

Fruit or shade, rates differ

Problem: *I plan on using Benlate to control scab. The label says use four to six ounces per l00 gallons on apples. For shade trees the rate is one pound per l00*



Balakrishna Rao is plant pathologist and Thomas Mog is pest management specialist for Davey Tree Expert Co., Kent, OH.

Questions should be mailed to Problem Solver, Weeds Trees & Turf, 7500 Old Oak Boulevard, Cleveland, Ohio 44130. Please allow 2-3 months for an answer to appear in the magazine.

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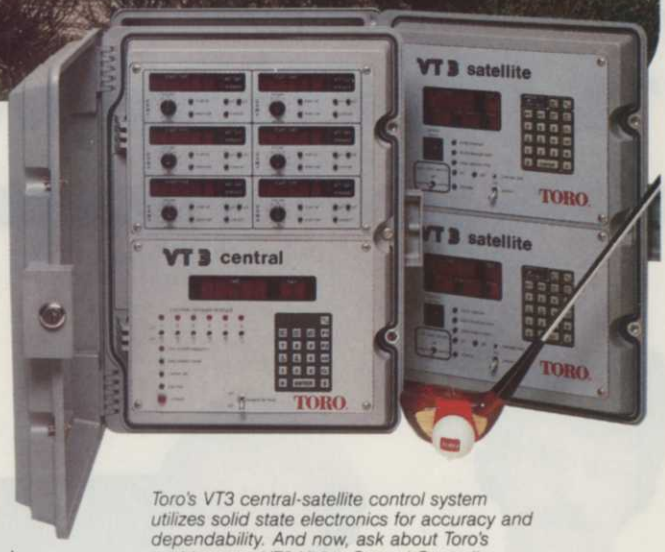

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Circle No. 143 on Reader Inquiry Card

gallons. The apple rate would be cheaper. Why the big difference? (Pennsylvania)

Solution: The "apple rate" is for apples as a food crop. Tolerance levels have been set for pesticide residues on food crops. At the shade tree rate the fungicide residue on apples might exceed permissible levels. Finally, most commercial fruit growers spray their trees weekly or bi-weekly thus reducing the need for a long-lasting residual.

Satisfactory control of scab on shade trees can be achieved with two or three applications of Benlate at the rate of one pound per l00 gallons. Follow the label instructions as to timing and possible use of wetting agents.

Multi-use spray tanks

Problem: *If washed, can a spray tank which is used for weed control be used for fungicide spraying of trees and shrubs? (New Jersey)*

Solution: It is difficult to remove some herbicides after they have been used in a sprayer. This is particularly true of the phenoxy herbicides that are used for broadleaf weed control.

The following suggestions are from the Ohio Cooperative Extension Service publication, Chemical Weed Control In Commercial Nursery and Landscape Plantings.

1. 2,4D - It is difficult to remove 2,4D compounds from sprayers. It is advised that sprayers used for applying these materials NOT be used for any purpose other than applying herbicides.

The 2,4D type materials can be removed if the following recommendations are followed immediately after use (as soon as spraying is completed).

a. Flush out the entire system with water detergent solution immediately after the solution (1 gallon of household ammonia in 10 gallons of water) and let stand for 12 to 24 hours. Disassemble the nozzles and soak the caps, screen, etc. in the ammonia solution.

b. Rinse thoroughly with water and let circulate through the sprayer.

c. Test spray a few plants which you know to be susceptible four to five days before using sprayer on larger areas.

2. PRINCEP - Rinse thoroughly with a detergent immediately after use. Check screens for clogging and, if present, soak in ammonia solution for 12 to 24 hours.

3. OTHER HERBICIDES - Any sprayer used to apply herbicides should be cleaned immediately after use. Special instructions for particularly troublesome herbicides have been previously outlined. If the procedures for cleaning out other herbicides are not specifically outlined,

a. Flush the sprayer system with clean water.

b. Rinse thoroughly with a detergent solution.

c. Rinse again with clear water.

The herbicide label may carry cleaning instructions. If so, follow the manufacturer's recommendation.

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EVENTS

JUNE

Harvard University Design Workshop, apply June 22 through August 16. Harvard University, Cambridge, MA. Summer advanced continuing education in the Graduate School of Design. Topics include Advanced Farden Design, Microcomputers in Landscape Architecture, Street Trees, Fountains and Pools, and Starting and Maintaining Your Own Firm. Tuition ranges from $400 to $1,150 and housing is available. Contact Continuing Education, 48 Quincy St., Cambridge, MA 02138 or call 617-495-9340.

Athletic Field Maintenance Seminar and Field Day, June 28. From 9:00 a.m. to 4:00 p.m. at Terry Park in Fort Myers, FL. Sponsored by the University of Florida Institute of Food and Agricultural Sciences. Contact Charlie Lowery, Court Plaza, D-103, 2663 Airport Rd. South, Naples, FL 33962.

JULY

American Association of Nurserymen Annual Conference, July 14-18. San Antonio, TX. The 109th Annual Conference will be addressed by Lady Bird Johnson. Includes meetings of National Landscape Association, Garden Centers of America, and Wholesale Nursery Growers. Contact AAN, 1250 I St., NW, Suite 500, Washington, D.C., 20005. (202) 789-2900.

Aquatic Plant Management Society Annual Meeting, July 15-18. Richmond Hyatt House, Richmond, VA. Contact William Rushing, P.O. Box 16, Vicksburg, MS 39180. (601) 634-3542.

American Sod Producers Association Summer Convention and Field Days, July 24-26. Olympia Spa and Resort, Oconomowoc, WI. Includes outdoor equipment demonstration. Contact Doug Fender, ASPA, 4415 W. Harrison St., Hillside, IL 60162. (312) 449-2844.

AUGUST

Landscape Technology Courses, Cal Poly University, August 14-16. Pomona campus offers three programs; Arboriculture/Urban Forestry, Nursery Operations, and Dry Climate Landscaping. Contact Wayne Smith, Cal Poly, Pomona, (714) 835-5550.

International Society of Arboriculture Conference, Quebec City, August 18-23. The 60th annual conference of ISA will be held at the Le Chateau Frontenac, Quebec City, Quebec, Canada. There will be educational sessions and commercial exhibits for all types of arborists. Contact Cal Bundy, ISA, P.O. Box 71, Urbana, IL 61801. (217) 328-2032.

Wisconsin Turfgrass Association Field Day, August 27. Oconomowoc Country Club, Oconomowoc, WI. Complete, "hands-on" display of outdoor power equipment. Contact Ed Devinger, Reinders Brothers, Inc., P.O. Box 57, Elm Grove, WI 53122. (414) 786-3300.

To insure that your event is included, please forward it, 90 days in advance, to: WEEDS TREES & TURF Events, 7500 Old Oak Boulevard, Cleveland, OH 44130.

Park has to be a first day of the season."

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Circle No. 131 on Reader Inquiry Card

LETTERS

Rose kills in Missouri

I was very interested in Michael Dirr's April article entitled Winter Damage.

In my area of southeast Missouri (zone 6) people are now observing widespread rose kills and plant damage. Although 1983 began as a wet spring, the rains stopped in May and did not resume until October. We apparently received adequate fall rains, but our roses did not face any cold weather until mid-December when temperatures dropped drastically to about -16° for a couple of weeks with wind chill factors of -60° occasionally.

I believe that my area of Missouri does not get cold enough in the fall to harden plants properly for the cold arctic blasts that come in December and January. However, since we get frequent fall and winter rains instead of snow, should roses be protected with heavy mulches of straw and sawdust which might be damaging by holding too much moisture? Would it be better to cut roses back about two-thirds and cover them when conditions moderate?

Also, I have observed several roses which are alive at the crown that were on their own roots. I am not sure if this means anything or not since I need more observations.

Larry Hanning
Area Entomologist
State of Missouri Agriculture Department, RR1, Box 312, Burfordville, MO 63739

Thank you for sharing your observations. We ask other readers to share their observations about winter kill as you have. You letter is being forwarded to Michael Dirr for a reply.

Exotic or native, adaptable trees needed

Douglas Chapman's article on street trees in the April issue was informative, as always. I agree that an effort should be made to find adaptable species for urban growing conditions, but I think Chapman puts too much emphasis on the use of natives.

Many desirable native trees are unsuitable in street tree planting programs. In Missouri, natives accustomed to poor growing conditions such as post oak, hickories, sassafrass and others are commercially available.

Almost half the trees mentioned in

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Circle No. 254 on Reader Inquiry Card

Chapman's list of species for planting on adverse sites are imports. None of these should be rejected just because they are exotics. Using the criteria of native vs. non-native to select trees needlessly narrows the number of choices and restricts diversity.

What difference does it make if ninety percent of the trees in an urban area are exotic if they are the best trees available for the job?

Tim Frevert
Landscape architect
Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180

University of Georgia swims upstream

I agree with Dave Pinkus in general (Trends, April, Colleges Care More About Grants Than Students), but some of us are swimming upstream. I enclose our program for the Ornamental Horticulture program at the University of Georgia, Athens. It has a good smattering of management and economics. If you know of some firms who want to hire interns or graduates of our program, please let me know.

Jake Tinga
Professor of Ornamental Horticulture
University of Georgia, College of Agriculture, Athens, GA 30602

Thanks for the memories

The Man of the Year trophy adorns my living room and is greatly admired. So far, we haven't filled it with suds or bubbly.

Thank you for giving me the exposure in select company—it was a thrill.

Fred V. Grau
President
The Musser International Turfgrass Foundation
College Park, MD

Fred V. Grau was presented the third annual Man of the Year trophy during a meeting of the Board of Directors of the Musser International Turfgrass Foundation at the GCSAA Show in Las Vegas. The Board consists of hand-picked contributors to the turf industry. Editor.

Forsythia poor indicator of crabgrass germ

I have just read Landscape Log in February *Weeds Trees & Turf*. A common mistake made and that has been circulated is the idea that crabgrass germinates around Forsythia bloom. I have been watching this occurrence for the last three years in the Salt Lake City area and have noticed that crabgrass typically is much later than Forsythia bloom.

Forsythia can bloom four to six weeks before crabgrass germination. Crabgrass germination has been so regular in our area that it seems like it is tied into photoperiodic response in some way. Germination in our area has been around May 23 each year for the last three years in heavy as well as light soils!

If I were to tie it into some sort of landscape phenology, I would probably use Radiant crabapple bloom, apple or pear bloom.

In our area, I've suggested that preemergents should be applied no later than the first week of May.

Robert L. Morris
Ornamental Horticulture Specialist
Utah State University
Salt Lake City, UT

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The next time you want to know something in the green industry, give them a call. If you can't reach them at the office, don't worry. They'll reach you in the pages of ***WEEDS TREES & TURF.***

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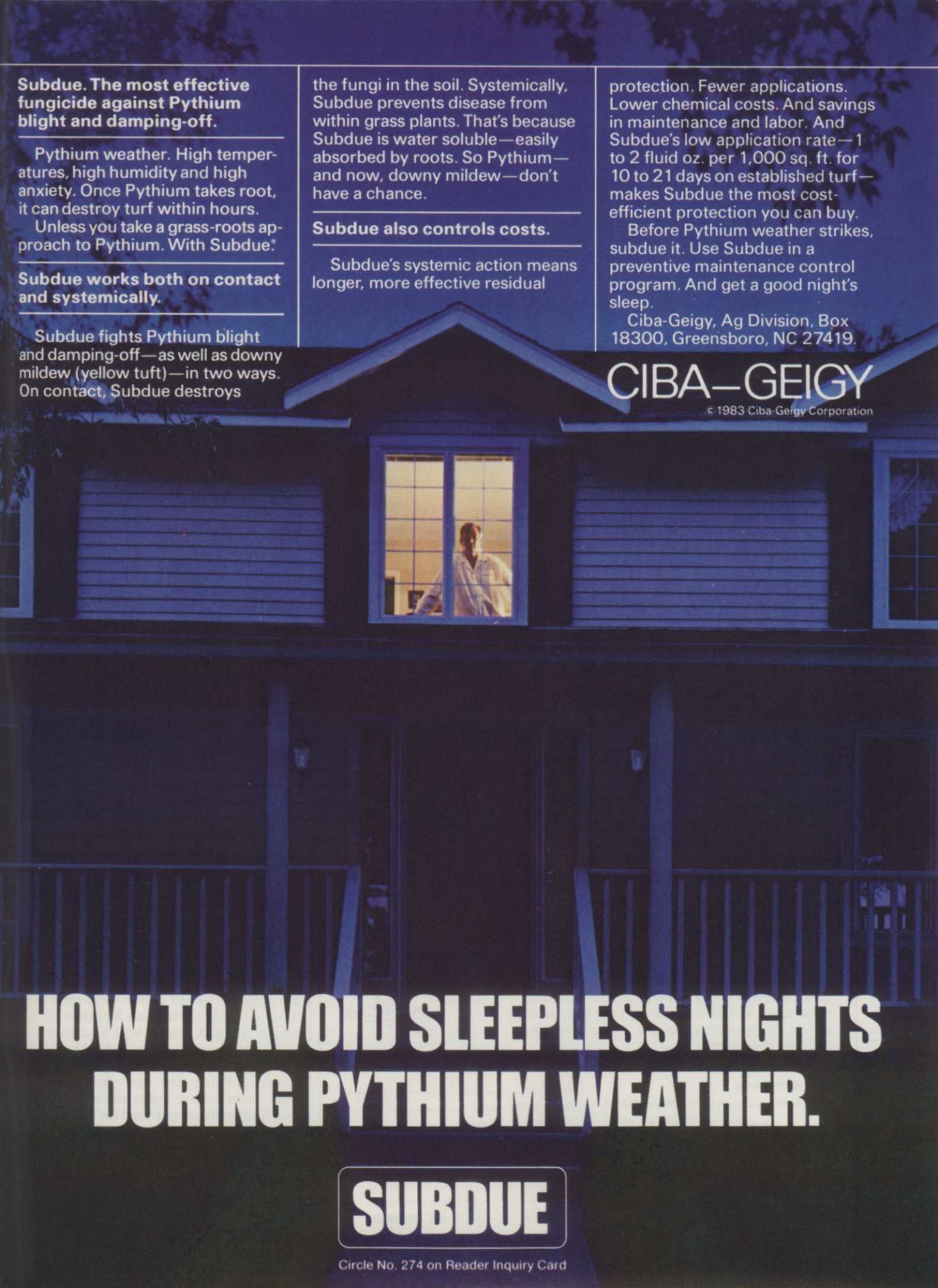

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SURVEY *from page 16*

in Ontario, has generated some of the first data on turf expenditures in the Province. The data show the value of producing and maintaining turfgrass in Ontario ranks third considering all agricultural products, after corn and tobacco.

The value of expenditures on turfgrass maintenance by all user groups was conservatively estimated at $275 million, with $75 million spent on turf equipment and $26 million on pesticides, sod, and seed. Commercial lawn service sales were pegged at $45 million, although a few lawn care operators told *Weeds Trees and Turf* this figure is low.

Golf courses spend more on maintaining turf than any other user group, followed by residential lawn care and sod farms.

Government turf managers surveyed indicated extension specialists could not help them with their most serious problems of labor and equipment shortages. Private turf managers were more supportive of extension services in problem solving.

Copies of the survey results are available from the Ontario Turfgrass Research Foundation, 54 Hernshaw Crescent, Etobicoke, Ontario, Canada, M9C 3M4.

GOLF

China plans prime golf resort complex

Construction is expected to begin by the end of 1984 on a major golf resort complex in the city of Guilin, People's Republic of China.

The Ronald Fream Design Group, golf course architects in Santa Rosa, CA, has been commissioned to prepare the master plan. The Fream Group, along with Hong Kong-based architects and engineers, will prepare the plans for three eventual sites in the scenic area.

The Beijing Government intends to develop the Guilin region with international standard tourists facilities, of which the golf resorts will be a part.

The initial site will include 18 holes of championship calibre golf, golf school practice area, and clubhouse. A 60-room luxury lodge and an additional 18 holes are planned for the site, which has exotic limestone pinnacles, rolling land, and pine trees. A second site near the Lijiang River gorge will have 36 holes of international standard competition golf, a teaching and practice school, and several other recreational facilities.

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Nursery Marketing Council

Using the "good times" to build buying habits consumers will remember if "bad times" come

Thirsting for answers

There is a very real threat to the Green Industry looming on the horizon.

It's water. Not only lack of it, but quality as well. Everyone seems to know a problem exists, but somehow the threat hasn't been real enough yet and the bite in the pocketbook hasn't been big enough to build any kind of a groundswell of concern.

When the editors of WT&T decided to do a story on this critical issue, we didn't realize just how wide the floodgates were that we were opening.

For two and a half months I became immersed (sorry, no pun intended) in the subject of water. With every phone call I made, with every interview I did, with every bit of water information that flooded my "in" basket, this germ of a story idea had a rippling effect -- growing wider and wider with each new piece of information.

It was amazing that a resource so common and so taken for granted has such a profound effect on so many parts of our lives and livelihoods. From golf course superintendent to landscape architect to city water department official, from California to Florida, the sophistication level of knowledge and understanding of this very imminent threat to the health and well-being of an industry was indeed impressive.

What's being done industry-wide to ebb the tide of a shrinking resource is even more impressive. The Green Industry has very few ostriches with their heads buried in the sand waiting for the problem to go away. There is an awareness that while the U.S. essentially has enough water right now, that picture could change rapidly and drastically with continued misuse and fickle Mother Nature.

Next month and in August, a good many of the pages of this magazine will be devoted to a two-part series on water use, conservation, quality and quantity as it effects the Green Industry.

Part I will take a particularly hard look at problems in Florida, California and Texas because of the types of water problems those states contend with and the quantity of water they need to survive. In Part II in August, we will concentrate on solutions to some water problems through low water use turfgrass and ornamentals research, industry association involvement, and how the pivitol industry -- irrigation -- is responding to the increasing challenges.

The picture, surprisingly, while serious, is not bleak. The water situation in this country, does, however, demand continued and diligent attention by an industry who will feel any tightening of control of water the hardest.

Somewhere in this upcoming series you will see yourself and your industry. Hopefully, it will be as part of the solution, not the problem.

Maureen Hrehocik

Maureen Hrehocik, managing editor

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Clemfine	—	7.2	—	—	7.3	6.3	5.9	4.1	6.3	4.6	5.9	6.0
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